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The Gloves Off

THE "war" which the gas industry has chosen to declare on us at the outset of renewed E.D.A. activities has not found us altogether unprepared. We prefer the candour of Sir David Milne-Watson, president of the National Gas Council and chairman of the Gas Light and Coke Co., in letting us know that the "gloves are off" to the more specious plea which Sir Francis Goodenough, chairman of the British Commercial Gas Association, is reported to have made on the previous day that there is room for both electricity and gas. The first indicates outside recognition that the aggressive and progressive elements on the electrical side are now in the ascendant; the second makes an insidious approach to weaknesses on our own side.

We have this initial advantage: although gas has thrown down the gauntlet, it must fight on the defensive. It cannot hope to make progress among the five million consumers of electricity, whereas the ten million gas consumers (the majority of which are on the routes of our existing distributors) are all potential users of our product.

The gas industry will fight with all the weapons at its command, and we must not under-estimate the skill and energy with which they will be used. We had an example of this recently in the well-organised, though fortunately unsuccessful, opposition put up to the acceptance of the South Metropolitan Electric Power Co.'s tender for street lighting in Lewisham with electric discharge lamps.

The importance of this electrical success is not to be measured by stating the mere mileage of streets lighted under this contract, but by its implications for the future. Street lighting is a field in which the gas interests are strongly entrenched, and they rightly regard this as a good advertising medium. The electrical industry also knows that whenever mains are laid for street-lighting, applications for private supplies follow very quickly.

The rate at which we bite into the gas preserves will depend upon our own efforts. We are strong enough to study our own weaknesses, some of which we referred to in our last week's leader. In their latest report the Electricity Commissioners say that the restrictive policy of development adopted by many public authorities owing to the financial crisis of 1931 was still being pursued at the end of last March, even for a productive service like that of electricity supply. They point out that the postponement of schemes has resulted in a diminution of orders for electrical plant at a time when the costs of the principal raw materials are low.

How much of this is due to short-sightedness, how much to slackness, and how much to the hidden hand of gas, due to a common ownership of the two undertakings? Whatever the proportions may be, our methods of replying to the gas attack will be different. If the electrical industry is out to ruin the gas industry, as Sir David suggests it is, it will succeed only because it can render a very much better service to the public.

Modernising Our Kitchens

IT is announced that the Electrical Development Association is organising a competition for architects in the design of all-electric kitchens. Any effort to improve the design and decoration of modern kitchens and make them the labour-saving workshop of the home is to be heartily encouraged. It is important that these things should be kept well before the minds of architects and builders who are responsible for the design and erection of new property of the low-priced class, but the problem is also present in £1,000 to £1,500 houses, where so little space is being set apart for kitchen quarters. The problem of new property, however, is not so troublesome as is that of houses which were erected thirty, forty and up to seventy years ago. We have suggested on previous occasions that the work of making all things new in many old kitchens is a matter for those who are qualified to follow the combined callings of builder and electrical contractor, and we hold that there is plenty of room for profitable specialised co-operation along these lines. Resident-owners in most of such houses are reluctant to make big changes unless they are sure tenants for a considerable period, and they are not in the habit of dealing with architects when they want to make better use of their domestic quarters. As we face the great work of electrifying

old houses let us come well down to earth. How many of the unelectrified homes of Britain fall into this category?—some millions if we mistake not. Those who are out to win electricity consumers must make a study of these things, so that the abandonment of a kitchen range, a dresser, a gas stove, and so forth, in favour of their electrical superiors can be shown to be a comparatively simple and inexpensive matter.

The Day of Small Things

FROM time to time we have commented on the tendency for the manufacturers of the heavier electrical equipment, and distribution apparatus generally, to look towards the domestic field, which is recognised as holding the greatest potentialities for the future development of the industry. Ferranti's, the English Electric, the B.T.-H., Reyrolle's and Crompton Parkinson, to name some which spring to the mind, have all commenced to tackle in earnest the business of supplying the practically unlimited market for electric household appliances. Now we have Henley's in the market with a new waffle baker, which, apart from a soldering-iron, is their first essay in this direction. With their well-established organisation these concerns should be very favourably placed in the matter of marketing, and should be able to stem the flood of cheap foreign apparatus which threatened to overwhelm us a year or two ago.

"I Go A-fishing"

SIR ANDREW DUNCAN, Chairman of the Central Electricity Board, is to be Chairman of the Sea Fish Commission which is to investigate the operations of the fishing industry and report on its future organisation. Of course this fact, which was announced in the House of Commons on Monday by Mr. Elliot, the Minister of Agriculture and Fisheries, interests all who are connected with electricity supply development, and they will offer unstinting congratulations. It is understood that his new duties will not conflict with Sir Andrew's efforts to secure the success of the grid. We hope that such will be the case, for we are at a stage when every ounce of effort is needed in pursuit of our common objective.

The Trade Position

THE October returns of overseas trade issued by the Board of Trade indicate that the electrical industry is holding its own very well, and is still improving the favourable balance which was sadly diminished two or three years ago. While exports have fallen by £272,000 so far this year, as compared with 1932, imports have declined by £424,409, and the proportional decreases are much greater than the mere figures indicate. The strongest points in the October export figures are the items "insulated wires and cables," which show an advance of over £20,000 as compared with the corresponding month of last year, and "telegraph and telephone apparatus" with a rise of £44,000. In the import list the latter item is again prominent with a fall of over £17,000. It is also interesting to note a setback in the imports of electric lamps.

Electric Sign Progress

IN practically all large centres—city, town and suburban—there is evidence of increased activity in the electric sign trade. Mr. Hamlyn Drake, in his speech at the meeting of Drake & Gorham, Ltd., singled it out as one of the bright spots in what was really a very dull year, with an adverse balance—the first since the crisis of ten years ago. The increased turnover in a section of the industry which he described as developing with extraordinary rapidity has led his company to form a separate concern which will equip a small electric sign factory in the Manchester district. Information to hand from other sources shows that firms specialising in sign parts are working at exceptionally high pressure. The opportunities that present themselves in the sign equipment of big business buildings, shop windows, exteriors and interiors of entertainment houses, aerodromes, churches, and even post offices, are increasing every day. A department of the electrical illumination business which hung fire for some years is at last making great progress, and bids fair to be still more successful as the public shows its appreciation of brighter living.

The Commissioners' Report

THE improvement in output of 7.7 per cent. for the year ended last March over the previous twelve months was, it is stated in the thirteenth Annual Report of the Electricity Commissioners, due to a general increase throughout the country, even Central Scotland and North-East England showing a recovery in output after two years of decline. We may reasonably hope that a similar indication is provided by the figures for the first ten months of this year, in which the increase is more than last year's total increase. Recovery from the spirit of false economy engendered by the crisis of 1931 should result in the resumption of a more active policy, with a correspondingly increased rate of progress. The section of the report relating to the satisfactory manner in which overhead lines withstood February's blizzard will repay study; the Commissioners claim that no failure could be attributed to the fixing of too low a factor of safety, but we do not recall any criticisms of the regulations on the score of their being too easy. There was a reduction in expenditure of £2,500 in the administrative costs of the Electricity Commission, which work out at about 0.00125d. per kWh sold.

Radio Consumers

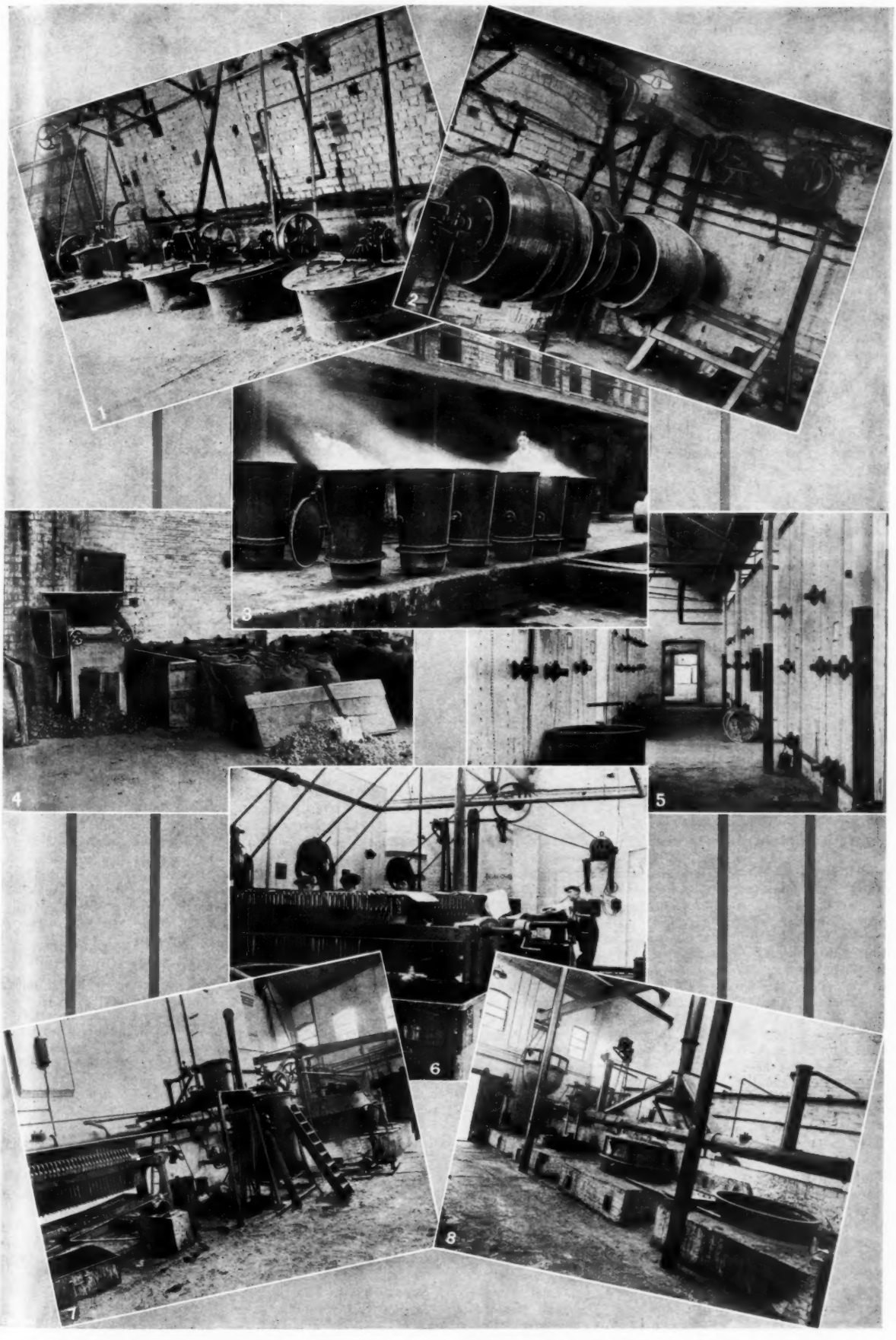
RADIO sets are usually regarded as negligible energy users but in the aggregate the consumption is quite considerable. There are nearly seven million licence-holders in Great Britain. If half of these operated all-mains sets averaging 40 W apiece for 500 hours per annum, the total consumption would be 60 million kWh—equivalent to the amount sold for all purposes in a town of the size of Stockport.

The Low-Voltage Grid

A ROUGH measure may be taken of the lower-voltage sections of the grid (and we call up to 66 kV "lower voltage" nowadays) from their aggregate route mileage, which is two-thirds of that of the 132-kV primary system. Although interest in the secondary system has been somewhat overshadowed by the more striking technical problems involved in the higher-voltage inter-connecting scheme, the former is likely to be of greater importance in the future to industry as a whole. The reason for this is that it tends towards pure transmission, and as the load at remoter points grows it will inevitably call for extensions. One of the most interesting points brought out in the discussion on Mr. C. W. Marshall's I.E.E. paper was that already some of the transformers in rural areas, which were installed with what appeared to be a very adequate margin to meet developments, are becoming too small for present requirements. This is good news, as their replacement will probably entail no financial loss; it is one of the virtues of putting money into sub-station plant and mains that they do not usually become obsolete (as power stations do) when they become too small for the loads for which they were installed.

Coal-face Lighting

THE possibility of a fire-damp explosion due to the breakage of a lamp bulb depends upon the rate of cooling of the filament, which is proportional to the current carried. In a paper issued by the Safety in Mines Research Board (No. 80, 6d.), Messrs. G. T. Allsop and T. S. E. Thomas show that for currents exceeding 2 A supply must be cut off before the glass is broken, but for less than 1 A the safe delay after breakage is from 0.12 to 0.02 sec. This disposes of the common opinion that 2-, 4-, and 6-V lamps, on account of their more robust filaments, are safer than 12-V lamps at the coal face.



The Production of Insulating Varnishes at a Stratford (London) Factory (See next page)

1 & 2. Plant for mixing spirit varnishes from gums and shellac, respectively. 3. Pots outside the works for cooling and thinning down. 4. A view of the raw-gum room showing the breaker. 5. Some of the storage and maturing tanks. 6. Filter presses. 7. Stand oil-making equipment. 8. Bakelite varnish production plant

The Production of Insulating Varnishes

THERE is room for a wider practical knowledge of insulating varnishes among users of such materials and insulated equipment generally, and the following impressions and information gained from a visit to the factory of Messrs. Jenson & Nicholson, Ltd., are calculated to help in this way. All varnishes are basically reasonably good insulators, so that the production of those with the higher insulating values depends on the careful selection of raw materials, refinement in production and the elimination, so far as possible, of any materials which would tend to have deleterious effects upon the dry film.

Broadly, there are four classes of insulating varnishes, namely, oil, spirit, black and bakelite. Oil varnishes are always used where flexibility and long life are required, and where it is necessary to stand high voltage. They are produced mainly from congo (fossilised) and manilla (semi-fossilised) gums, and also from rosin. It is found that these three materials give the best dielectric properties. Gums are available in various colours; but generally the colour is not a consideration for insulating varnish.

A varnish-film testing cabinet

Rosin is a gum produced from the distillation of turpentine. Because it is so brittle, real Buxton lime is added to harden it off and also reduce its acid value. Spirit varnishes are produced from shellac and soft manilla. They are used almost universally for finishing coatings over oil varnishes as an additional protection against moisture and oil.

For many years shellac was the only insulating varnish made, but it was found unsuitable for the higher voltages, and, moreover, it is too brittle to stand high-frequency and mechanical vibrations. It is a product of the Indian insect—the lac—which lives on the juices of certain trees, from the branches of which the shellac is gathered in its crude state before being purified in that country.

Black varnishes, which are also of the oil family, are used in preference to "clears" where high resistance to water and heat are required. They are particularly suitable where protection against very heavy overloads is required; for instance, the insulation of traction motors. They are produced largely from asphaltum, a natural pitch, or a by-product of petroleum. Gilsonite, a natural pitch found in America, is also used for "blacks." Bakelite varnishes are used where rigidity is all-important. Coils treated with this become absolutely hard; an example of their use is the treatment of the stators and rotors of large ceiling fans produced for tropical countries. They have the definite disadvantage of being quite inflexible, and consequently they tend to powder when subjected to much vibration. Further, they are unsuitable for use on enamelled wire as the solvent employed, methylated spirit, attacks the enamel.

Producing the Oil Types

For the oil varnishes the gums are first passed through a breaker in which they are reduced to roughly uniform size of about from 1¼-in. to 2-in. pieces, to ensure uniform melting. The broken down material is heated in varnish pots with removable bottoms, which are welled over heat sources below the floor level. About 20 to 25 per cent. of the congo and manilla gums have to be "sweated off" (volatilised). This is a very skilful process and is akin to glass blowing in that it is a family job. It is not so with rosin, which only has to be melted. When the mixture is fluid enough heated oil is added. Only vegetable oils are used for this purpose, and these are mainly linseed and china-wood oils. They all possess the property of drying by absorbing oxygen.

The oil is first stored in very large tanks in which it is allowed to mature for some weeks. It is conveyed from the tanks by pumps and a pipe-line into 250-gallon oil coppers, which are heavily lagged and jet heated around the sides. It seemed to us that the oil was run off from the coppers in watering cans—by which the liquid was added to the melted gums in the varnish pots. The oil is heated to about 300 deg. F. In the case of rosin, the gum is heated to about 450 deg. F. before the lime is added, and the mixture is then boiled until it is clear, when the oil is added in the same way as with the natural gums. Actually during boiling the rosin and lime form a chemical compound. When the oil and gum mixtures "string" correctly on a glass plate, the pots are removed outside and allowed to cool. When necessary dryers are added, but these are reduced to the absolute minimum, and in many cases no dryers are used at all. Thinners, usually turpentine substitute, are added when the varnish is sufficiently cool.

The operations in black-varnish manufacture are very similar. Oil is added to melted pitch, but dryers are rarely put in. When the mixture has cooled off, white spirit is added and the mixture is well stirred. The spirit simply renders the material fluid enough to apply. In producing bakelite varnishes a chemical combination of phenol and formaldehyde is produced by a very accurate and scientific temperature control in a specially designed jacketed and heated tank. The phenol is put in in the form of crystals and then heated before the formaldehyde is added, when the reaction takes place. A very slight error in connection with the temperature control would result in the mixture becoming quite solid. The resultant compound is a liquid product which is soluble in methylated spirit, and this spirit is used merely as a diluent in the same way as white spirit is used for the other varnishes.

Improving by Keeping

Where heavier bodied varnishes are required, stand oil is used. This is simply linseed oil "bodied" up in special containers. The mixture is agitated while heat is applied in the absence of air. When the oil mixtures are sufficiently cool the fluid is pumped through pressure-type filters, in each of which foreign material is separated by a series of filter papers on cloth backs. The actual filtering is a slow process and the clear oil trickles into sunken tanks from which it is pumped into large maturing tanks holding up to 3,000 gallons each. While warm there are in the varnishes certain metallic salts in solution and during the maturing process these settle in the form of sludge. There is no definite time for maturing, for it is a fact that the product, like wine, improves with keeping. This is all-important from the insulating point of view, because it is always the foreign matter which results in leaks and breakdowns. Six months is considered the minimum time for maturing any varnish.

So far we have considered only oil varnishes. Production of spirit varnish is a much simpler matter, because no heat is required. One method employs crushed gums; these are shot into tanks, after which methylated spirit is added and the mixture is subjected to heavy agitation for some hours. For shellac varnish the mixture of shellac and methylated spirit is put into large barrels, balanced at the ends on trunnions, and the barrels are revolved for several hours. All spirit varnishes are subjected to similar filtering to that employed for the oil varnishes, but the manilla product has to have an initial crude filtering. Congo gum, being insoluble in spirit, cannot be used for this kind of varnish.

Pigmented Varnishes

Pigmented varnishes, contrary to the probable general belief, are not used mainly for colouring, but for protection on such articles as battery terminals and bus-bars, but one interesting case of the former use is the treatment of dynamo coils with very light salmon pigmented varnish. The result is that dirt is easily discernible. Owing to the volatility of the solvent it is necessary to pigment the spirit varnish in a ball mill, which consists of a steel cylinder lined with silex and containing a large number of granite pebbles. The cylinder with the varnish and pigment mixture and the pebbles is rotated for several hours, and the grinding effected by the pebbles sliding over one another is superior to any other known method. It is, of course, necessary to select pigments which have the least possible effect on the insulating values of the product.

Electrical testing is, naturally, of primary importance. From each new batch of insulating varnish twenty or thirty samples are tested. In each case a varnish film is placed between fixed and movable electrodes in a metal testing chamber which surmounts a special 200- to 25,000-V, 1-kW, 50-cycle transformer. The drop-down door of the chamber is interlocked with the main switch by a worm-operated sliding type rheostat. The applied voltage is steadily increased until breakdown takes place. Most yellow varnishes have a breakdown voltage of 1,200 to 1,500 per mil thickness of film. The equivalent values for "blacks" are slightly lower. The testing equipment was specially constructed for the job by the Foster Engineering Co., Ltd.

Inefficient Driving by D.C. Motors. By E. W. Short, A.M.I.E.E.

A case for conversion and connection to the grid

THE latest available census of production in Great Britain disclosed a power load of some 2½ million h.p. driven electrically from private generating plants, this figure excluding the mining industry. By far the majority of the motors are direct current machines. Although from the national point of view such load should be supplied from the grid, the owner of private generating plant is about the most difficult problem of the supply authority's sales department,

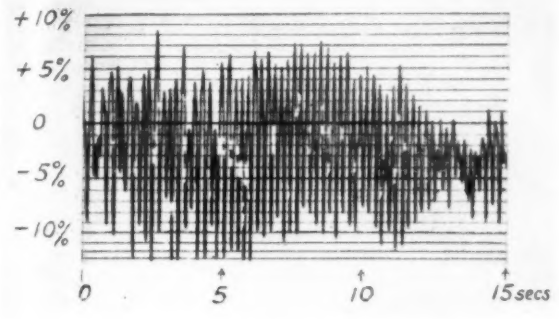


Fig. 1

because not only are these private plants claimed to be quite economical—they do appear so, if only the usual items of fuel, oil, labour and capital charges are taken into account—but the owner is apt to assume that he has already secured, and is enjoying, all the benefits which can be expected to accrue from electric driving.

Rapidly Varying Loads

Nevertheless, it would be to the owners' immediate and lasting advantage to transfer a great proportion of this load to the grid. Wherever the driven load is of a rapidly varying character, such as is found in many industrial applications, and especially in the textile industry, the d.c. motor cannot provide anything like as good a drive as the a.c. induction motor. This observation applies to the driving of any kind of machine which affords a quickly reciprocating, intermittent, or periodic loading, or where a group drive includes any considerable proportion of such machines. Although the d.c. motor can be designed and built to maintain a steady uniform speed from no load to full load for so long as the loading is itself steady or varies only slowly, it cannot be made to drive at a steady speed when its loading varies rapidly and widely, even within the limits of the ordinary rating of the machine. When such machines are driven by d.c. motors, the owner does not secure the maximum benefit and advantages from electrical driving that he supposes, which can only be obtained by converting to a.c. driving.

It will be convenient first to illustrate the kind of effects noted in tests of active installations and afterwards to examine the typical consequences, assign the cause, and confirm the prescribed remedy.

The graphs, figs. 1, 2 and 3, are reproductions of speed-test

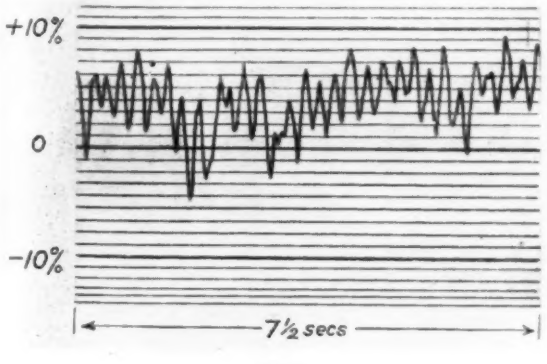


Fig. 2

records of three separate d.c. motor drives, obtained at different times by means of a Moul recording tachograph, with adjustable paper speeds. Vertical distances between adjacent horizontal lines represent a speed change of 1 per cent., the range of the chart thus covering a variation of 12 per cent. above and 12 per cent. below the centre lines. The first two graphs record the speed variation on *main* shafts of group drives in weaving sheds, driven respectively by a 10 and a 20 h.p. d.c. motor. Fig. 1 covers a period of 15 seconds and shows a speed variation, due to the uneven torque demanded, amounting to a maximum of about 20 per cent. and a minimum of 2 per cent., as the looms oscillated more or less in step or out of step. Fig. 2 indicates less irregularity in speed, here amounting to about 13 per cent., but the chart speed was faster, the length of this record covering 7½ seconds only, thus spreading out the peaks and hollows.

The remaining graph (fig. 3) was obtained from a countershaft in a mule-spinning room driven from an 8 h.p. d.c. motor, and represents a total time of 1¼ minutes. This graph is of a repeating character, corresponding to the periodic character of the load during the drawing, spinning and run-back stages respectively of the operation. The sudden application of maximum load at two points in each cycle, and the inability of a d.c. motor to develop the necessary increase of torque with sufficient rapidity, as shown by the speed record's dropping suddenly to the lowest limit of the chart, is a fruitful cause of belt slip when attempting to pick up and accelerate the dead load.

Speed and Output

The d.c. motors on the three drives in question were standard machines, and would ordinarily be expected to run with not more than, say, 4 per cent. speed variation from no load to full load, with the field at any given temperature, the brushes properly set, and with steady loads applied. The much larger speed variation obtained (since the conditions of the tests definitely precluded the possibility of belt slip as the cause except as stated) can only be attributed to the inability of the motor to hold a steady speed under the rapidly varying load torque in each instance. It is also clear that in a group

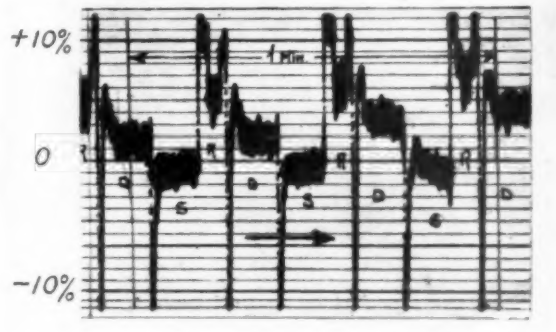


Fig. 3

drive one or more machines working on an intermittent load may upset the even running of the whole of the remaining machines in the group. In the case of any industrial drive, the first consequence of irregular speed would be a reduction of output, and therefore of the productive efficiency of the machine, due to the reduced total number of revolutions in a given period, and other unwelcome effects may, or may not, result, depending upon the work performed.

Instances are not infrequently found in which a driven machine may do poor work, and the product may prove to be below the standard anticipated, both as to quality and quantity, without apparent reason. The textile industry provides outstanding examples of this sort. Not only must a given maximum speed in spinning or weaving be not exceeded, because of the excessive breakage of threads that would result, but further, a jerky or variable speed is more likely to cause breakages than even turning. Hence, the highest "peak" values of a variable speed must be reduced below the maximum permissible for steady driving, to allow a reasonable margin of safety. Therefore, the first outstanding consequence of an inefficient drive is a considerably reduced quantity output. But of equal importance is the fact stated by textile manufacturers that the yarn, or cloth, which is spun or woven by machines driven at a steady speed is more uniform, and therefore of a better quality and commanding a higher market price, than material which has been produced on badly driven machinery.

Why D.C. may be Unsuitable

The reason for the failure of even a well-designed d.c. motor to maintain a uniform speed when driving a rapidly variable torque load is by no means obvious at first view. Uniform speed under steady conditions can be assured by correctly designed differential compounding of the field windings and

proper adjustment of brush position. If interpoles are fitted, the brushes usually need not be moved from the neutral position. An examination of the various factors affecting the equilibrium of a running machine, however, and consideration of the possible rate of change of current, flux and torque to restore equilibrium upon the occurrence of any sudden change of loading shows that the failure of the d.c. motor to hold a uniform speed is fully in accord with theoretical considerations.

The root of the trouble with the d.c. motor, under the conditions indicated, is that any change of loading, necessitating a corresponding change in the torque exerted, can only be met either (*a*) by a change in the speed and current, or (*b*) by an adjustment of the current and field flux, if the speed is to remain steady. If the load change takes place slowly, the transient conditions producing a flux adjustment have sufficient time to operate without unduly affecting the speed. But any adjustment of the field flux takes time to become effective; actually, the rate of change of flux is determined by the well-known inductive time constant of the field windings, and a change of value may require anything up to a second or so to take effect. If, therefore, a heavy load comes on more rapidly than the flux can change, the speed must necessarily drop, to recover only when the flux has had time to adjust itself, or when the load goes off, whichever is the earlier. The effect is similar, of course, to that obtained when the brushes of a machine are inadvertently wrongly set, but the question of lag in the time of recovery is independent of brush setting or of the compounding of the motor.

This characteristic defect of the d.c. machine is not sufficiently well known, nor is it dealt with in the usual text-books, but, as the facts are both demonstrated by test and supported by theory, their existence deserves to be more widely appreciated by power engineers who are concerned in securing the maximum efficiency in electrical power drives, and by salesmen who have to deal with the usual stock objections of owners of private plants. The extent of the improvement to be gained by converting and driving by a.c. may easily be more than sufficient to warrant the cost of conversion.

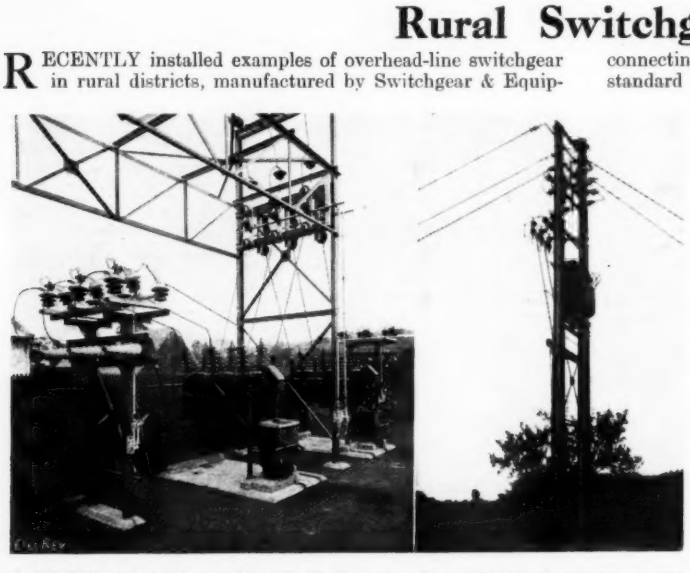
The Effect of Temperature upon Speed

It may also be useful to bear in mind the other and better-known characteristic of the d.c. shunt or compound motor which is often found to limit output and efficiency; namely, the speed change due to alteration of temperature. The resistance of shunt field coils increases by some 15 per cent. upon attaining full working temperature from cold, and in the absence of any speed-adjusting rheostat the working speed of the machine may be expected to rise from 3 to 8 per cent., or more, according to its design, in consequence of the reduction in value of the exciting current at the working temperature. If the speed when hot is the maximum permissible, then the drive is perhaps 5 per cent. below normal efficiency when the motor is first started up cold. If worked only intermittently, the motor may always run below rated speed. And in modern production a loss of output of 5 per cent. is important.

By comparison, the modern induction motor, which has a speed variation due to the slip of from 2¼ to 4 per cent. from no load to full load, depending upon the frame size, is unaffected by temperature changes or by transients and therefore runs closely at its rated speed, however sudden the changes of loading. Frequently, it is found quite feasible to drive by an a.c. motor at an average speed noticeably above the maximum previously recorded, or considered safe, and thus to obtain an increase of output actually greater than the anticipated value. Thus the transfer of variable and pulsating loads to the grid, and the replacement of the d.c. motors by a.c. induction machines, provide a complete solution to the problem of obtaining maximum production in such instances, and may also be the means of securing a product of superior quality and market value.

Rural Switchgear

RECENTLY installed examples of overhead-line switchgear in rural districts, manufactured by Switchgear & Equipment, Ltd., exemplify developments in the design of disconnectors, fuse isolators, and pull-down switch-fuses.



A 33,000-V sub-station with "S. & E." air-break horizontal and vertical switches provided with self-aligning high-pressure contacts (Derby & Notts Power Co.)

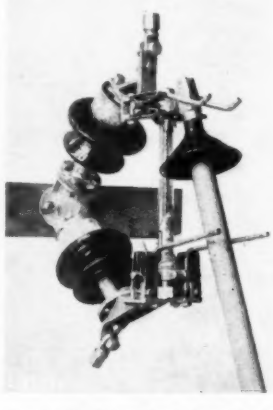
An 11,000-V ring-main transformer pole with pull-down switch-fuse and two disconnecting switches

We illustrate part of a 33,000-V sub-station on the Derbyshire and Nottinghamshire Electric Power Co.'s system with air-break horizontal and vertical disconnecting switches. These switches are provided with self-aligning high-pressure contacts which are much more efficient on outdoor service than the old type of knife blade and socket contacts. The bearings are lined with phosphor bronze bushes and the rocking insulator pedestals are fitted with adjustable buffer stops in both the closed and open positions, so as to relieve the porcelains of mechanical stresses when operating the switches. The phase coupling is of heavy drawn steel tubing of "D" section, the operating lever being clamped to it in the most convenient position, *i.e.*, either between phases or at either end.

The stirrup-type handle is provided with a universal joint and an easily adjusted turnbuckle to take up any mal-alignment or slack in the operating rod.

Another picture shows the latest type of pull-down switch-fuse mounted on a 36-ft. "H" pole with two vertical disconnecting switches and a transformer. This comprises a standard 11,000-V ring main terminal transformer pole, the transformer being fed either from the overhead line or from the underground cable, or disconnected entirely and the overhead line connected to the cable. In this arrangement clearance from ground to nearest live metal (the transformer terminals) is maintained at 20 ft., a figure well on the right side of regulation requirements. The fuses can be renewed and replaced from the ground level. The switch itself is provided with self aligning high-pressure contacts and arcing horns and is capable of opening under full-load conditions without sustaining any damage. Special consideration has been given to the erection of this unit and adjustments are provided to take care of every possible contingency, such as inaccurate drilling of poles or of leaning or settlement of poles. These pull-down switch-fuses are also made suitable for mounting on single poles and for 33,000-V as well as 11,000-V systems.

A new design of lift-out fuse isolator is designed for protecting small 11,000-V rural transformers up to about 50 kVA. By means of a portable operating rod and a special bell-shaped guide the fuse is easily removed and replaced from ground level when mounted at a height of 20 ft. When removing the fuse the top contact is broken first by inserting the head of the operating rod in the guide and pulling downwards. The fuse pivots in the lower contacts and when it has passed through an angle of 180 deg. it is easily disengaged from the lower contacts by a slight upward movement of the rod, when it can be brought down for replacement.



An 11,000-V lift-out fuse isolator

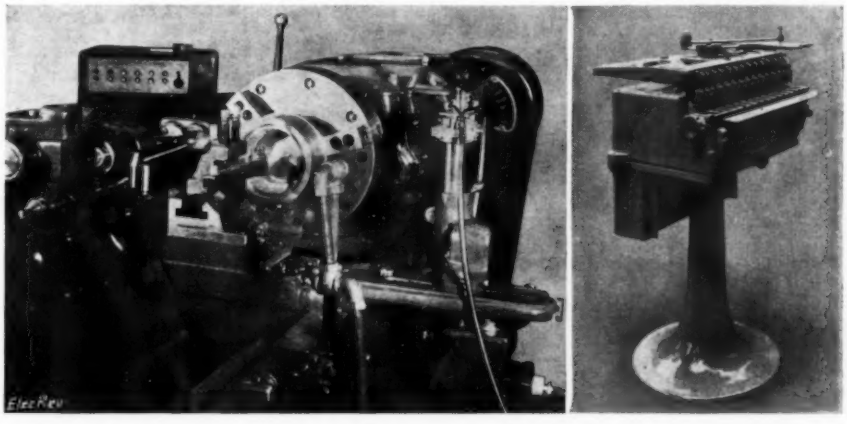
These are examples of the company's standard lines produced at its Banbury works.

Machine Tools for the Plastic Trade

FOUNDED in 1889, the business of Alfred Herbert, Ltd., now affords employment for a large number of people in the manufacture of machine tools, gear-cutting and shaping of exceeding precision, and the making of "Atritor" coal pulverisers. All machines are built for stock to standard designs in batches of from six to fifty, according to size. The works and offices at Coventry cover an area of 17 acres, being the largest single storey factory of its particular kind of which we know. The main machine shop alone has a floor space of 8.25 acres within four walls, under one roof.

In welcoming members of the London and Midland sections of the Institute of Plastic Industry at luncheon in the works' canteen last week, Sir Alfred Herbert remarked that the plastic trade had developed rapidly and become an important factor in industry. It foreshadowed the elimination of machining operations and the eclipse of the machine-tool maker, and no doubt, before long, most things would be moulded. "Well," said Sir Alfred, "if you must cut my throat, first let me sell you the knife with which to do the deed."

In the course of the visit we saw a range of machines particularly suitable for die sinking and the production of moulds for plastic materials. Ingeniously devised, without excessive elaboration of design, they are not only motor driven but also controlled in operation by electrical means. Thus, the "Keller" system of control, which is of American origin, enables a master shape to be reproduced automatically by a milling machine, either profiling in two dimensions or by three-dimensional cutting. A tracer passes over the master form and, with the aid of contactors, relays and electro-magnetic clutches, causes the cutting tool to duplicate its path precisely, regardless of shape.



Left: A "Monarch-Keller" form-turning lathe. Right: A machine for simultaneously etching several articles

How the Tracer and Cutter Operate

The master forms can be quite simple: light metal templates, solid wood or cement, finished tools that require to be duplicated, or worn or broken dies which can be replaced directly with great economy. The cutting accuracy is such that hand finishing is much reduced, polishing being all that is required.

The tracer is mounted on a bracket above the cutter and they move in unison. A movement of less than 0.001 in. of the tracer point will vary the motion of the machine, and this degree of sensitivity is independent of the size of the mill, depth of cut, or hardness of the material. In addition, all movements may be operated either manually or by push-button switches from a control cabinet for setting up a job or plain milling and boring.

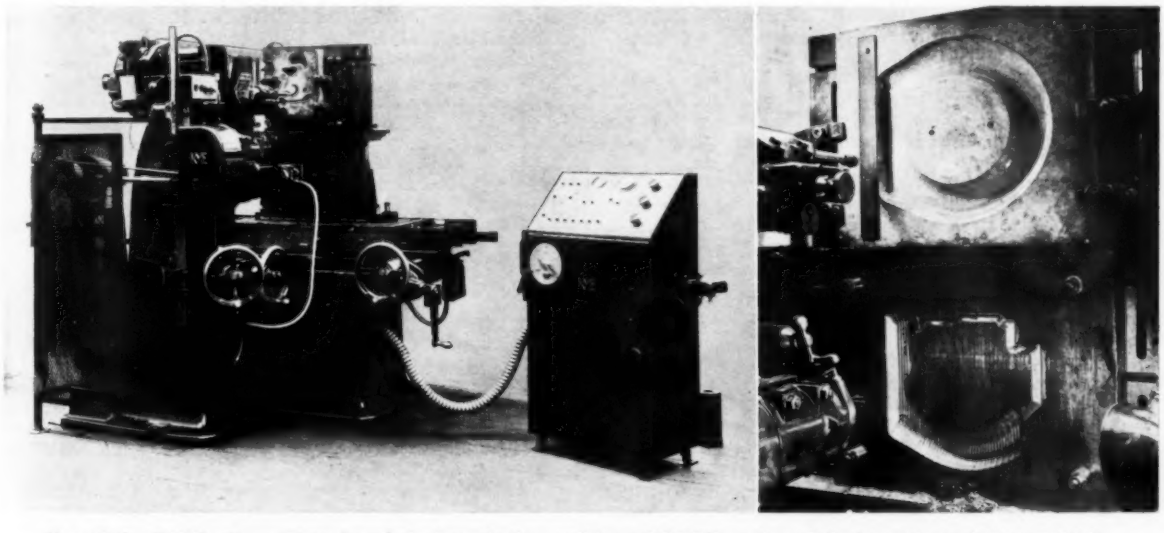
Five built-in d.c. motors are employed; 3 h.p. for the cutter drive and 0.25 h.p. each for the horizontal, vertical and transverse drives and the lubricant pump. Spindle speeds range from 80 to 3,600 r.p.m. The high-speed spindle is driven direct by a variable speed self-contained machine designed specially for very small milling cutters. It develops, under rheostatic control, from 8,000 to 11,000 r.p.m., and the cutter is protected by automatic interruption of the feed when the power consumed by the motor reaches a predetermined maximum. An adjustable intermittent feed, regulated by a knob on the control desk, slows down the normal speed of travel by automatic interruption through a commutator. It permits operation below the lowest geared rate of travel.

Very small mills for delicate detail and narrow slots can be used, as well as cutters of from 0.036 in. to face mills 4 in. in diameter; this machine (type B4) is an unusual combination of sensitiveness and ruggedness.

The Type G "Keller" machine rigidly maintains relation ships between holes to be bored and surfaces, slots or impressions to be milled. The accuracy is said to be of the order of 2.5 tenths of one-thousandth of an inch, and in many cases renders hand finishing unnecessary. This result is obtained in less time than is usually needed merely to rough out a job on hand-operated machines.

The tracer keeps in continuous contact with the template, always seeking the edge, yet never breaking through it. In this case the tracer is semi-electrically controlled, the operator having to govern the general direction of travel by periodical manipulation of the position of a spring contact maker relative to the contour of the template. To make all the parts of a die only one male and one female template are required.

The Type GG machine is similar, but is in addition able to locate and bore jigs with great precision. Special vertical and horizontal vernier scales with electrically-illuminated magnifiers enable decimals to be read direct from the blue print, and the vernier to be set accordingly without calculation to determine successive location. Snapping a toggle switch moves the machine towards location by a magnetic clutch-driven lead screw. Stopping at location is automatic and



One of the "Keller" machines for producing plastic moulds and (right) a view of the template and the mould in process of production

Electrical Equipment for Motor Vehicles. By C. J. Webb

DURING the past few years there has been a steadily growing tendency to draw upon the electricity furnished by the car dynamo and battery for many services supplementary to the three main ones of ignition, lighting, and engine starting. In this country, after a full consideration of relative merits, automobile electricians have preferred 12 to 6 V, but for commercial vehicles 24 V is used in some cases.

Improvements which have been effected in recent years in the manufacture and assembly of the components of the battery have added materially to their useful life, but larger batteries, if not bigger dynamos as well, would on many cars be desirable but here the question of cost, especially for mass-produced popular-priced vehicles, is a factor which manufacturers have to take into account. The dynamos used on cars are nowadays mostly of the third-brush type, which has the merit of being relatively simple, but the current generated is a function of the voltage, and to prevent over-charging of the accumulators resistances are provided in the field circuit, to allow either low or full charging rates to be used. The Lucas Electrical Co., Ltd., has recently introduced a compensated-voltage dynamo, the output of which varies in accordance with the condition of the battery and provides for an increased current to balance that taken by the lamps and other accessories.

Some reduction in the work starters are called upon to perform has lately been effected by improved forms of carburetters. A modern development is the provision of an additional device for automatically restarting the engine, while the ignition is switched on, should it stop owing to slow running in traffic or other reasons; an electro-magnetic starter switch, included in the ignition circuit, becomes energised when the engine stops and so brings the pinion of the starter into engagement with the flywheel. While the system may have advantages for cars fitted with free wheels, many still regard it as an unnecessary complication.

The Ascendancy of Coil Ignition

For ignition the magneto has, for the present at least, been replaced by the battery-coil-distributor system which is now used on about 85 per cent. of all petrol pleasure vehicles built in this country. Although the question of first cost may have had a good deal to do with the change, from the technical aspect the alteration is attributed to the ability of the coil system to supply a "fatter" spark than the magneto at low engine speeds, and to function more satisfactorily at high speeds. Engines capable of running at 4,000 r.p.m., on sports cars, are nowadays by no means uncommon, while the speed of highly tuned racing-car engines may reach 8,000 r.p.m., which means that the ignition system of a six-cylinder engine has to furnish no fewer than 400 regularly timed sparks per *second*. In the latest ignition equipment there is a tendency to make greater provision for the automatic advance and retard of the firing point, this being secured under the influence of two factors—the speed of the engine and the degree of vacuum existing in the inlet piping. As many car users still prefer magneto ignition and are willing to pay for it, the B.T.H. Co. and the Scintilla Co. have introduced magneto units which can be mounted in place of the standard coil-ignition distributor.

The numerous electrical devices used in and about the modern car give relatively little trouble, although many of them depend on contacts which are entirely out of sight and consequently receive no attention, while others are linked up by wiring to an instrument board on which the various switches are mounted. Hence the wiring of a car, and particularly its insulation and anchoring, is of paramount importance, in order that short-circuits may be avoided. The recent Olympia Motor Show revealed that car manufacturers are nowadays taking more care in this direction.

One of the most recent informative papers on automobile electrical equipment was that read in January last by Mr. E. A. Watson, M.Sc., before the Institution of Automobile Engineers. In winding up the discussion on his paper the author said that the whole of a car equipment included was built to a price and a definite life, and on the whole he would say that the life of the electrical equipment as supplied at present was appreciably longer than the life of the bulk of the parts of the car itself.

In the majority of large motor service stations, an electrical department nowadays forms one of the chief sections of the business, while all the leading equipment and battery makers have set up their own electrical service stations in the principal centres. One of the largest of the equipment manufacturers claims to have nearly 500 agents able to give efficient service. In various centres, technical institutions are providing facilities for the instruction and training of young men for service work. To a large extent, however, this is as yet only available by a careful study of the instructional literature available.

A Useful Guide

The latest work on the subject is "Automobile Electrical Equipment: A Complete Survey of Electric Lighting, Starting and Ignition as Applied to the Internal Combustion Engine," by Messrs. A. P. Young, M.I.E.E., and L. Griffiths, A.M.I.E.E. (Iliffe & Sons, Ltd., London, 15s. net). As the authors correctly state, while the designs of individual components may be in a steady state of flux, their fundamental principles remain unchanged. They have consequently adopted the plan throughout the work of giving an analysis of the principles on which evolution of design is based, first to make clear the detailed operation of the various electrical devices described, and secondly to enhance the educational value of the book.

The work is spread over seven main chapters, each being divided into numerous sub-sections. The first is largely devoted to such primary electrical matters as units, conductors, resistances, insulation, and electro-magnetism. The second is given over to a general survey of the different uses to which electricity is applied in automobiles, while the succeeding four chapters deal respectively with generators, starting motors, accumulators, and automobile lighting, including a consideration of the dazzle problem.

The final chapter of the book is devoted to ignition: as it runs to no fewer than 139 pages, whereas the other two main subjects of lighting and starting occupy between them less than ninety pages, it would seem to indicate that the authors attach the greater importance to ignition. Of the nine sections into which the chapter is divided, only one is devoted to the battery-coil system now almost exclusively used on cars, whilst five sections are allotted to magnetos and magneto ignition. The disparity in the amount of space allocated to the two systems is no doubt due to the scope of the work embracing aeroplanes, commercial vehicles and motor cycles, on which magnetos continue to be mainly relied upon for ignition, and possibly also to the fact that the manufacture of battery-coil ignition equipment is in relatively few hands and now very largely standardised.

The text is well elucidated by diagrams and illustrations, the 336 pages including 308 line drawings and half-tones. The book concludes with a fairly comprehensive six-page index, but many of the references are somewhat curt, consisting merely of a single word such as "volt," "watt," "Boudeville" and "Fizeau," the two last turning out to be the names of early workers in connection with high-voltage magnetos and Ruhmkorff coils. The work can be strongly recommended to young men who are employed as, or who contemplate entering the calling of, automobile electrical equipment maintenance and repairing experts.

Machine Tools for the Plastic Trade (*continued from the previous page*)

accurate to within 0.0002 in., when contact is made with the vernier slider. This precision is entirely independent of wear of lead screws or other moving parts. The drive and lubricant pump motors are of 0.25 h.p., and the spindle motor of 1.25 h.p.

A Variety of Shapes Possible

The Monarch-Keller form-turning lathe was seen machining a punch and mould for a twelve-sided bowl. It will turn, face, and bore irregular contours, triangular, square, hexagon, and almost any shape, in addition to round and oval, for which a thin master template can be made, and it works with an accuracy within 0.001 in. Both length and cross feeds are controlled electrically, and when the "centrode" device and push-button control disc are disconnected the machine is available for any normal lathe work.

The Taylor-Hobson electric etching machine is an attractive alternative to the acid etching method. It works from enlarged masters of the lettering required, being controlled mechanically on the pantograph system. The etching is done by very small electric arcs, and one machine has a row of tungsten points for marking fifteen articles simultaneously. Each point needs less than 2 A at 6 V, the total load of the machine being about 300 W. A main switch is fitted, and a four-position rotary switch varies the current for three depths of etching.

Herbert electrically driven lathes, drills, grinders, sawing, filing, and milling machines were also inspected. These machines, the electrically controlled models particularly, are great time savers and tool-cost reducers. They can produce complicated moulding tools as economically as simple ones, which means that design is freed to a large extent from the limitations ordinarily imposed by tool costs. The ability to make tools rapidly enables the manufacturer to keep pace with a changing market, and cost reduction curbs the tendency to use tools beyond their economic life, thus maintaining uniformity and improving the product.

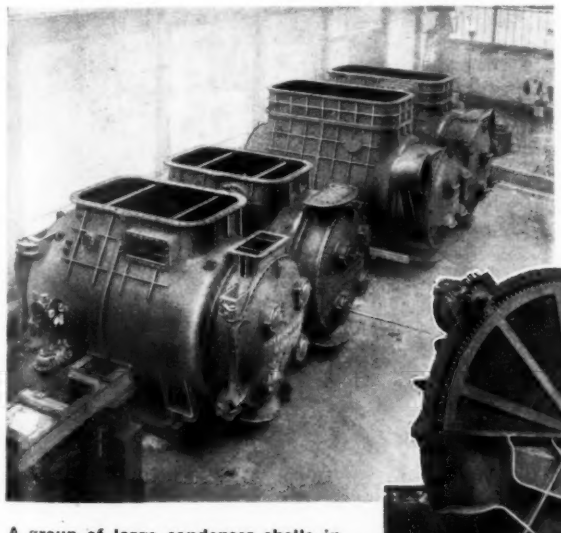
Steam Plant Progress

Some developments during the last century

ONLY by keeping abreast (or ahead) of the times can any industrial concern hope to continue to exist. This is especially true of the engineering industry, which in about a century has become the most essential to modern civilisation. It can safely be said, therefore, that a firm which has been in the industry for a hundred years and is still hale and hearty has grown up on sound lines. Such a concern is that of Hick, Hargreaves & Co., Ltd., which is celebrating its centenary this year.

From their earliest days Messrs. Hick, Hargreaves have specialised in industrial power plant for textile and paper mills. In 1864 they introduced to this country the Corliss valve engine, which was first produced as a single-cylinder equipment, and later, with the increase of boiler pressures, compound expansion engines were introduced in sizes up to 4,000 h.p. The progressive increase in steam temperature led first to the introduction of the drop-valve engine and then, earlier in the present century, to the Uniflow engine, in which the whole of the expansion, from boiler pressure to condenser vacuum, takes place in a single cylinder, drop valves being employed for the inlet of steam, and open ported valves, uncovered by the return motion of the piston, for the exhaust.

In 1924 the company introduced an industrial steam turbine to take the place of the low-speed steam engine, in the first instance for rope-driven cotton mills, and the heavy duty imposed by this type of drive demanded very robust construction. A recent example of this type of equipment is a 1,500-h.p. turbine installed in an old engine room of an Indian mill. It was erected whilst the engine to be superseded was running, the rope pulley only being replaced when the engine was dismantled. The turbine is designed for the extraction of 10,000 lb. of steam per hour at a pressure of 35 lb. per sq. in., and it has resulted in a saving of 40 tons of coal per week.

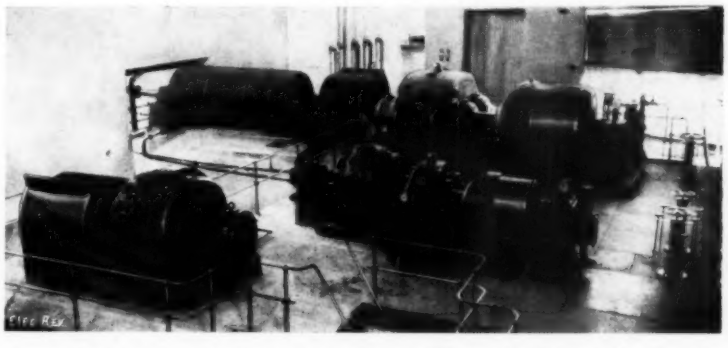


A group of large condenser shells in the Hick, Hargreaves workshops

It is an impulse turbine, and it has a single row of velocity wheels mounted separately on the shaft. The blades are milled from a solid stainless steel bar, and the fixed nozzles are also of stainless steel. The turbine runs at a speed of 5,000 r.p.m. and drives a rope pulley through reduction gearing at 320 r.p.m. The steam is condensed in a surface equipment and the circulating and extraction pumps are driven from a separate rope pulley on the same shaft.

A second example is a 1,100-kW pass-out turbine set installed in a paper mill. The steam valve under the turbine casing controls the flow of extraction steam to the mill, amounting to 15,000 lb. per hour at 45 lb. per sq. in. Together with this turbine, the company supplied a water-tube boiler with 250 lb. per sq. in. and 650 deg. F. steam conditions, and the necessary switchgear, for connecting up to the existing mill motors. The alternator was produced by Messrs. Mather & Platt, Ltd.

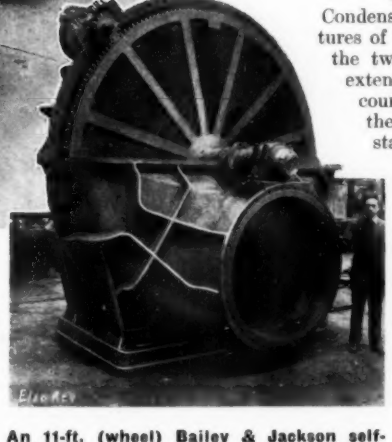
In a large new cotton mill in India a 3,600-h.p. turbine supplied by the company drives the main machinery of the mill by ropes, and also a 400-kW turbo-alternator for supplying the electrically driven departments when the main turbine is closed down. During normal operation a 400-kW alternator is driven by ropes from the main turbine.



Power plant in a new Indian cotton mill: A 3,600-h.p. turbine rope-driving the main mill and a 400-kW alternator; and a separate 400-kW turbo-alternator

In the application of a turbine for driving existing machinery it frequently happens that it is not possible to arrange a direct rope drive to certain sections of the plant, and for this purpose the alternator is employed. The company has supplied a large number of such mixed-drive turbine installations, in each of which as large an amount of power as possible is taken by the ropes from the pulley connected to the turbine through reduction gearing. The alternator and exciter are driven from an extension of the rope pulley shaft, and supply energy for mill lighting and for motors situated in more remote portions of the mill.

The arrangement of the plant is usually governed by existing site conditions, and in some cases it is found necessary to drive the rope pulleys through the alternator shaft. In one instance a 3,000-b.h.p. turbine drives through reduction gear a 1,000-kW alternator, and the remaining power by ropes from two main driving pulleys. The first pulley supplies 600 h.p. to d.c. generators, and the second one, in the rope race, drives directly on to the main mill shafts. The pass-out turbine, in addition to generating all the power required supplies process steam at 25 lb. per sq. in.



An 11-ft. (wheel) Bailey & Jackson self-cleaning water strainer for 2½ million gallons of water per hour

Condenser Manufacture

Condensing plant has been one of the main manufactures of the company since 1916, when it introduced the two-stage steam jet air ejector which is now extensively employed in power stations in this country. Recent orders include condensers for the 75,000-kW units at the new Barking power station and the 50,000-kW set at the Ironbridge power station of the West Midlands Joint Electricity Authority. The equipment supplied for these stations includes all the equipment in the cycle from the turbine exhaust to the boiler feed pump.

The company is also sole licensee for the Bailey & Jackson self-cleaning water strainer, which consists of a slowly rotating wheel carrying the straining medium. At each revolution a stream of cleaning water removes the debris from the screen. It can be fitted into existing pipe lines, and it is entirely automatic in action. A recent development of the company is the rotary air compressor which employs a cylindrical rotor revolving eccentrically within a casing. The rotor is fitted with freely moving blades which, under centrifugal force, produce cells in the space between the rotor and casing, the air being carried round and compressed in these cells. Restraining rings in the casing prevent the blades from bearing heavily on the cylinder. The relatively high speed of rotation and the continuous impulse-free flow of air renders the equipment particularly suitable for electric driving. This type of compressor or vacuum pump can be supplied for delivering from 15 to 4,000 cu. ft. per minute.

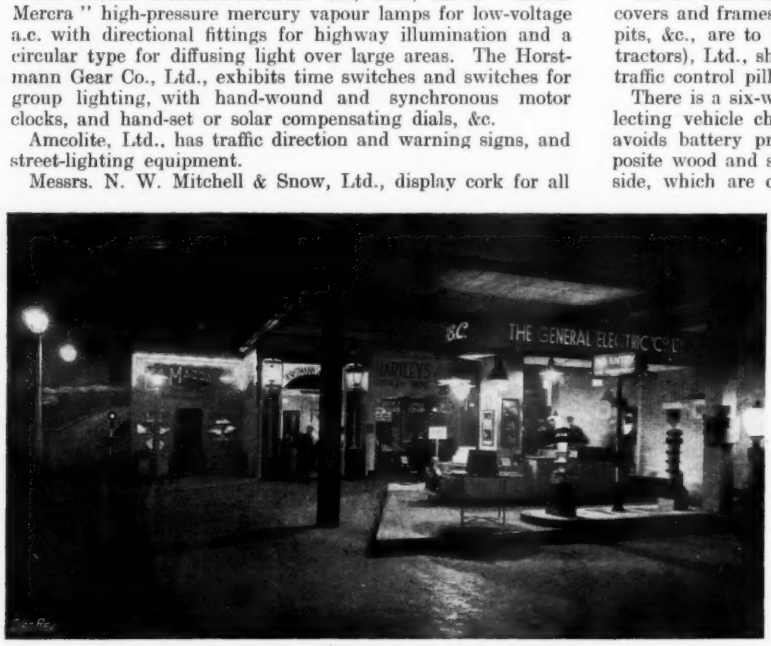
The Public Works Exhibition

THE electrical exhibits at the Public Works Roads and Transport Exhibition at the Royal Agricultural Hall, Islington (November 13th to 18th), consist in the main of street-lighting equipment, traffic-control systems, road indicators, and warning signs. The papers read at the Congress contain little of electrical interest.

The British Thomson-Houston Co., Ltd., shows "Mazda Mercra" high-pressure mercury vapour lamps for low-voltage a.c. with directional fittings for highway illumination and a circular type for diffusing light over large areas. The Horstmann Gear Co., Ltd., exhibits time switches and switches for group lighting, with hand-wound and synchronous motor clocks, and hand-set or solar compensating dials, &c.

Amcolite, Ltd., has traffic direction and warning signs, and street-lighting equipment.

Messrs. N. W. Mitchell & Snow, Ltd., display cork for all purposes, including bird "warnings" for overhead conductors, and Messrs. Adam & Lane & Neeve, Ltd., show portable collapsible road shelters for cable jointers.



The British Thomson-Houston and G.E.C. displays

The stand of the Automatic Electric Co., Ltd., bears examples of vehicle-actuated "Electro-matic" street-traffic control signals and automatic telephones. The exhibits of Messrs. Gowshall, Ltd., include illuminated road signs and "Guardian Angel" guard posts for island refuges. Messrs. Hailwood and Ackroyd, Ltd., have a collection of lamp standards, directional signs, illuminated island posts, lighting glassware, and metal components.

The display arranged by the General Electric Co., Ltd., covers street-lighting equipment and lanterns, including "Osira" lamps for highways and floodlighting, prismatic glass reflectors, illuminated refuge bollards, road signs, "Autoflex" control gear for street lighting, and S.G.E. vehicle-actuated traffic signalling apparatus (Siemens and General Electric Railway Signal Co., Ltd.). The "Autoflex" controller is built up of standard telephone equipment on the replaceable jack-in unit principle. The road way detector is a heavy rubber moulding within which are two channels containing air at atmospheric pressure. The passage of a vehicle, in the approaching direction only, drives the air through pipes to a contact box in the pavement, wherein the pneumatic impulse is converted by a bellows contactor into an electrical impulse for transmission by wires to the signal lamp controller.

The Edison Swan Electric Co., Ltd., displays street-lighting equipment and the "Escura" low-voltage a.c. mercury vapour lamp with directional lanterns and "Saturn" flood lanterns. Messrs. H. R. Marsden, Ltd.'s exhibits include a double-deck type electro-magnetic vibrating screen. Instruments for measuring the flow of liquids are exhibited by the Lea Recorder Co., Ltd., the recording being done both mechanically and electrically; and water-level meters and recorders, electrically operated to transmit readings at any distance.

Messrs. Ransomes & Rapier, Ltd., have a one-ton truck mobile crane and a three-ton lorry crane operated on the petrol-electric system with an engine-driven variable voltage generators.

Messrs. George Kent, Ltd., show water and sewage meters with electrical recorders, including mains-operated flow and level transmitters with voltmeter-pattern distant receiving instruments. Complete sets of tools for underground cable laying and overhead line erection are exhibited by Messrs. George Pike, Ltd. Messrs. R. H. Lister & Co., Ltd., put forward Diesel engines and a small house-lighting set with engine-driven generator and battery.

On the stand of the Dover Engineering Works, Ltd., trench covers and frames for power and telephone cables, transformer pits, &c., are to be seen. Messrs. Johnston Brothers (Contractors), Ltd., show artificially constructed stone lamp posts, traffic control pillars, &c.

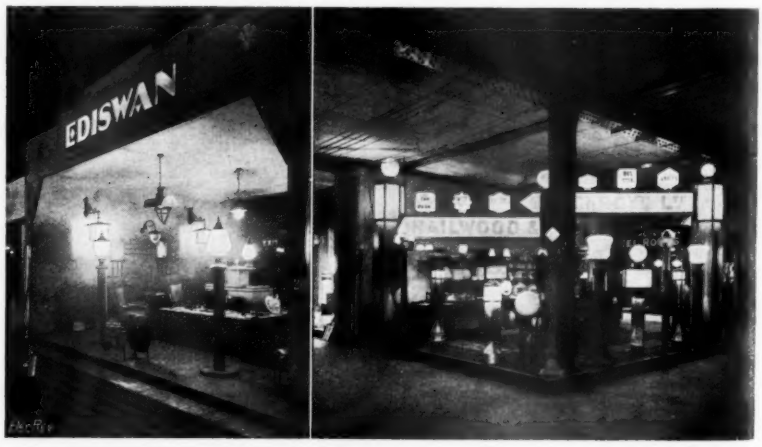
There is a six-wheel battery-propelled low-loading refuse-collecting vehicle chassis by Electricars, Ltd. The new design avoids battery projection outside the wheels, and the composite wood and steel body has three sliding shutters on each side, which are opened by an upward hand-operated movement. Messrs. John Allen & Sons (Oxford), Ltd., exhibit a new type of "Allen-Parsons" excavator suitable for cutting trenches from six to twelve inches wide and up to 4 ft. deep.

I.R.S., Ltd., are sole distributing, installing, and maintenance engineers for automatic street-traffic control signals made by Messrs. Laurence, Scott & Electromotors, Ltd. Besides the fixed time cycle signals, new vehicle-controlled gear is now available. Messrs. Simpson (Rye Harbour), Ltd., show reinforced concrete hollow spun poles manufactured by the "Hume" centrifugal process and used by tramway and electrical supply undertakings. The Fraser & Chalmers Engineering Works has a selection of crushing, screening and conveying plant, the "Sherwen" screen being vibrated electro-magnetically.

Reinforced concrete lamp posts are displayed by Concrete Utilities, Ltd.: some are made with "Cullamix" and others treated with "Tintocrete" to resemble various metals. Cable covers and high-voltage joint boxes are also to be seen on the stand. Messrs. Thomas Locker & Co., Ltd., show examples of woven wire screens and conveyor belts, and electro-magnetically vibrated screens, and Messrs. John Smith & Co. (London, E.), Ltd., cable jointers' street tents, collapsible huts, tarpaulins, &c.

The Electroflo Meter Co.'s display comprises electrically operated liquid and steam flow meters of various types, a motor-driven CO_2 indicator and recorder, a.c. synchronous motor-driven chart pyrometer recorders, temperature regulators, suction and pressure gauges, level recorders, &c. The Franco-British Electrical Co., Ltd., exhibits neon and other electric signs, and the Brighton Lighting & Electrical Engineering Co., Ltd., shows traffic signs, illuminated island pillars, house-service fuse boxes, and a range of metal standards for street lighting, of suitable heights for from 100- to 500-W lamps and fitted with Holophane "Duodome" refractor lanterns. Among the exhibits of Messrs. Ruston & Hornsby, Ltd., are a crude oil locomotive, a road roller, engines, pumping plant, and the "Thermax" patent vertical water-tube steam boiler.

R. H. Neal & Co., Ltd., make mobile cranes of from 6 cwt. to 2 tons, which may be electrically driven and mounted on road or rail wheels, or a caterpillar undercarriage, with full circle slewing.



The stands of the Edison Swan Electric Co. and Hailwood & Ackroyd, Ltd.

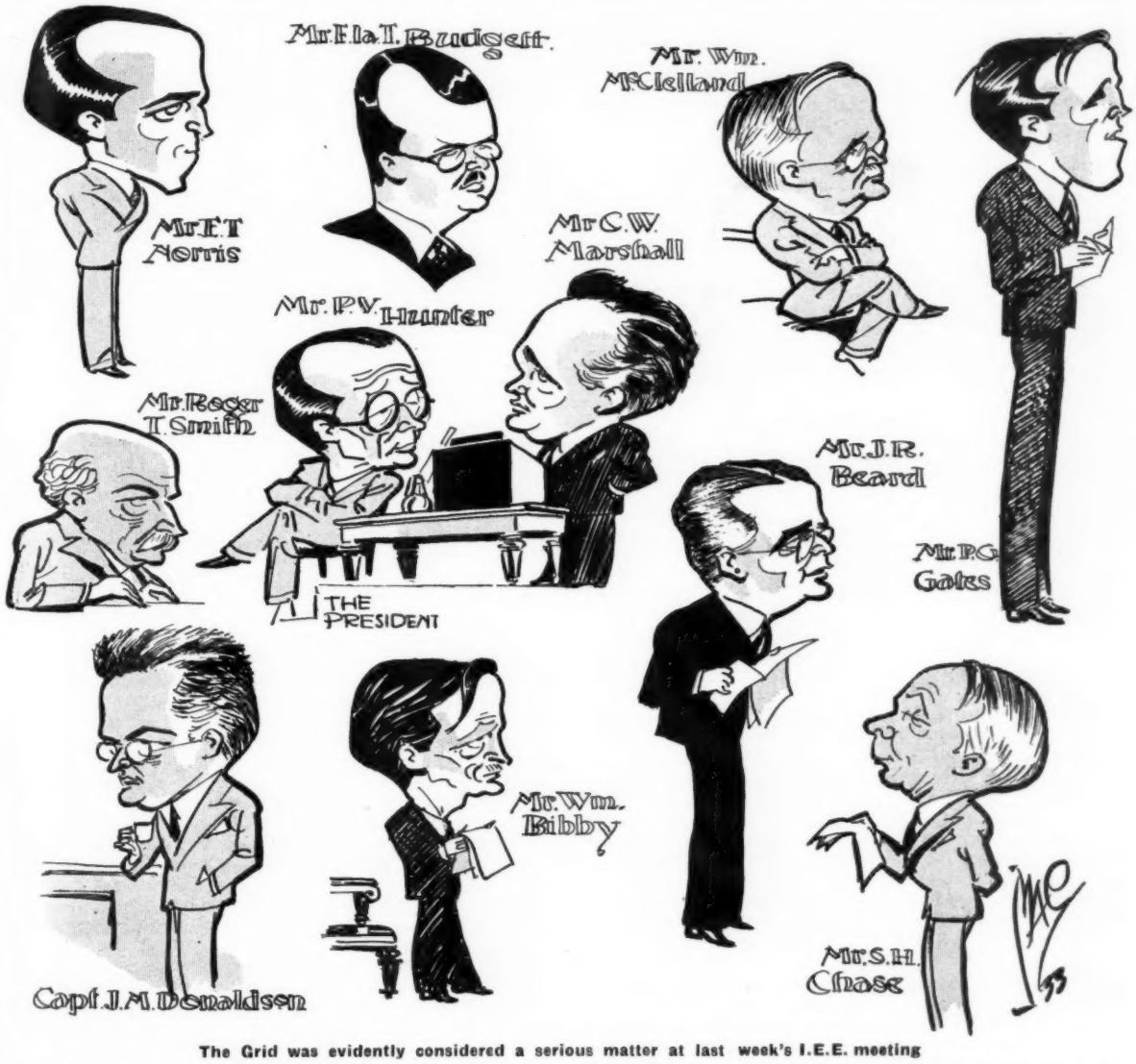
MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

The Grid's Secondary System

THE President (Mr. P. V. Hunter) was in the chair at the ordinary meeting of the INSTITUTION OF ELECTRICAL ENGINEERS on November 9th, when Mr. C. W. Marshall read his paper on "The Lower-Voltage Sections of the British Grid System," which was referred to in our last issue.

The ensuing discussion was opened by Mr. J. M. Kennedy, who expressed the hope that the secondary system of the grid would expand and be used for feeding the railway electrification systems which were anticipated during the next five or ten years. He asked for the author's view as to the relative merits of the pin and suspension types of insulator, remarking that figures in the paper implied that the pin type could be constructed much more cheaply. Referring to the connection of comparative costs of single-core, solid and oil-filled cables, but some indication was desirable of the more or less arbitrary basis necessarily adopted for some of the figures. The paper took a temperature rise of 30 deg. with the solid cable and 60 deg. with the oil-filled cable, but experience indicated that 45 deg. could be generally accepted with the solid cable, reducing the ratio of increase of current carrying capacity of the oil-filled over the solid cable from 62 per cent. to 25 per cent. Referring to insulator tests, Dr. Dunsheath said that if an insulator was beginning to deteriorate it should be possible to find that out by a power factor test. Major T. Rich said that rural electrification was being retarded in many quarters because of the fear that a huge tower would be erected and with



The Grid was evidently considered a serious matter at last week's I.E.E. meeting

of small transformers to the line without fuses, he said that these small transformers were now becoming so reliable that there was no need to spend unnecessary capital on protective gear. Mr. Kennedy showed a number of slides indicating developments in Ireland where the broad principles laid down in the paper had been generally adhered to.

Mr. J. R. Beard said that from the point of view of continuity of supply the grid compared very favourably with any undertaking in the world and also as regarded the cost per 1,000 kVA of transformers. Every section of the grid was now protected discriminately in a satisfactory manner. The Board's experience had shown that transformers could be connected directly to the lines and that had also been the experience on the North-East Coast. Already in certain rural areas the original transformers were becoming too small to meet the demands and there were other places where similar increases were in contemplation.

Dr. P. Dunsheath said the paper gave an excellent record regard to towers he said it was possible to go too far in the matter of height.

Transformer Flux Density.

Mr. P. G. Gates referring to the use of gilled-tube cooling radiators, said that if the intimacy of contact between tube and gill was affected by rusting the efficiency of cooling was likely to drop off. He also suggested that the flux densities in the transformer cores of over 14,000 lines per sq. cm. were very high and allowed no margin for variation in supply voltage. In recent designs for large transformers it had been found desirable to keep the flux density below 12,000 lines per sq. cm.

Mr. F. la T. Budgett compared the cost of the grid scheme with similar work in the United States, and said there was a greatly increased cost here on account of the work done in protecting telegraph and telephone lines. He said that in America large towers were erected by being hauled up into

position in the completed state whereas here the towers were built up piecemeal, this also increasing the cost. Mr. F. B. Frost asked if any records had been kept of the resistance to earth at grid stations, and also inquired if there had been any accidents from shock at the towers which justified any special precautions being taken. In Germany many years ago

THE TIME IS
4-48
WHITELEYS
The Universal Providers
wish you the time of day and welcome you to the store
ANY BUS TO QUEENS ROAD
IT'S ONLY THREE MINUTES FROM HERE
BAYSWATER ON THE MET
Elec Rev

The new electric time indicator at Paddington Station which was described in our issue of September 29th (page 416) is now in operation. As our picture shows, it forms part of a large neon-tubing advertisement

a scheme was devised so that there was a ring around the base of the towers, the ring being buried and connected to the tower so that the voltage gradient was gradually reduced. Mr. S. H. Chase referred to the nickel-iron batteries used for breaker operation, &c.; he said he regarded them as floating batteries, but if lead battteries were used, trickle charged as he understood the term, they would do the job equally well without the necessity for the periodical charges which apparently were now required.

Mr. W. Bibby pointed out that the tests applied to the insulators were higher than the B.S.S. tests; they were equivalent to having a line of higher voltage. Was that intended? Was not a high-frequency test for ten seconds likely to crack the enamel of the insulator? Mr. C. Le Maistre (British Standards Institution) said that the insulators were of such tremendous importance and value in the scheme that it might be possible for the Electricity Commissioners to assist manufacturers by introducing some sort of rating test in which the manufacturers could co-operate. The speaker suggested that it was possible to secure much more artistic effects with concrete poles than had so far been achieved in this country.

Continuity the Principal Aim

Mr. Marshall, replying to the discussion, said that the great advantage of the pin insulator was its comparative freedom from radio interference and the ability to carry on with a damaged unit in a string. The 30-deg. temperature rise mentioned in connection with the solid cable was the figure which the manufacturer claimed and he had not generally found manufacturers err on the side of modesty in these matters. Only insulators which supported spans over buildings would be removed for periodic tests; these were a very small proportion of the total. It was generally assumed that the ageing process commenced after five years' service. It was possible that power factor tests might be developed to give a scientific criterion of the quality of the insulators. No trouble had been experienced with the gilled tubes after four years' experience. To guard against all the dangers which the Post Office anticipated, it would be necessary to revert to armoured clothing. Continuity of supply was the definite aim in view and every possible step had been taken to ensure that it would be at least better than that of any rival means of supplying energy.

High-voltage Sub-station Switchgear

THE paper on this subject by Mr. J. R. Mortlock, which was referred to last week, was discussed by the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on November 7th. To Mr. A. L. B. Andrews' question whether it was good practice to keep both busbars alive when a duplicate was provided, the author replied in the affirmative; this arrangement permitted quick change-over.

Mr. W. A. Gilbert was surprised at the author's suggestion that for "tested" breakers hand operation was permissible, but Mr. Mortlock pointed out that provided the "safety" requirements were fully complied with manual control was justified for sub-stations with up to about nine circuits, where the maximum fault was in the neighbourhood of 350,000 kVA at 11 kV, and 250,000 kVA at 22 kV, but it was seldom applicable to 33,000-V circuits due primarily to the size of the oil circuit-breaker.

Mr. W. J. Minton said that relays at the back of the control board seemed to involve strain on the operator if he had to run round to the back under fault conditions. Mr. W. J. Oswald urged designers, in improving switchgear, to give more consideration to making it fit in with existing designs, because one of the biggest bugbears was to obtain sufficient space for sub-stations. For small sub-stations in residential areas, where expensive gear could not be considered, overload protection had to be used, but with gradually increasing load on a Sunday morning the plunger would creep into the core and then much more effort would be required to operate the switch. Thus, the hammer action was lost and one did not get the protection at the load for which it was set.

Mr. J. P. Morley, referring to routine maintenance, asked if it were possible to standardise a cyclometer arrangement on the switch itself to record the number of times the switch operated. Mr. W. A. Crocker suggested that if there were silver on the main contacts of a switch, burning would occur due to volatilisation. The importance of the double busbar and alternative switches seemed to be overstressed by the author; it was better to attain simplicity, particularly from the point of view of cost. The fewer the number of operations the more important was maintenance. Protection should be simplified as far as possible; in practice protective gear did not get routine maintenance.

Mr. W. J. Jeffery said that with the use of an on-load selector incorporated in a switch, as illustrated in the paper, if there were a failure on one set of busbars, quick transfer from one set to the other in order to get the maximum amount of load going might be dangerous. As to maintenance, the best compromise was regular examination of all switchgear at stated time intervals, and special examination of switchgear that had operated under fault conditions which had given a definite shock to the system. Mr. W. F. Kearsley stated that leakage relay protection, under the conditions at his station, was very good. Mr. Mortlock agreed that such protection had a very wide application; it was simple, it could be made sensitive and often it was practically the only type of protection applicable.

Electricity and Coal Mining

HITHERTO the colliery engineer had seldom looked beyond the confines of his own colliery, said Mr. J. F. H. Colyer, in his presidential address to the London branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on November 7th.

For the advancement of business it was necessary to get rid of this narrow outlook, for coal would survive less by its intrinsic qualities than by the deliberate exploitation of those qualities by those who mined and marketed it. Electricity and gas tended to decrease the domestic consumption of raw coal. It would be wrong, however, for this reason to regard the electrical and gas industries with animosity, for their requirements, together with those of the railways, constituted a steady annual demand of considerable magnitude. In effect, they transferred the burning of coal from the individual house to the works. The man who switched on his electric radiator or lighted his gas fire was as surely consuming coal as if he burned it in an open grate.

With regard to electrical matters, it was pleasing to note that H.M. Inspector of Mines reported that, but for one exception, the past year would have been the best of many past for freedom from accident. There was a steady, though irregular, growth in the use of electricity in mines. The Inspector had suggested the more extensive use of flexible armoured trailing cable in lieu of the usual unarmoured type, and Mr. Colyer pointed out that there were available conveyor cables having a layer of flexible armour over the c.t.s. covering with a further layer of tough rubber over the armour.

The issue of a new British Standard Specification for paper cables had enabled manufacturers to put a new series on the market at reduced prices. This, with the modern practice of extending the use of high-voltage cables underground, and thereby saving the large quantities of copper and lead required for low-voltage supplies, should enable mine electrification to be carried out at lower cost. High-voltage cables should not introduce undue hazard below ground, since all live metal would be shrouded, all boxes compound filled, all disconnecting performed by circuit-breaker, and the use of appropriate cable protection trips should isolate a faulty length before trouble could develop. It was advisable to bear in mind, however, that the application of the new Specification and the use of high-voltage cabling would be affected by the degree of gassiness in any mine.

The parochial point of view was to stand out for local generating plant, but, however attractive this might be to the

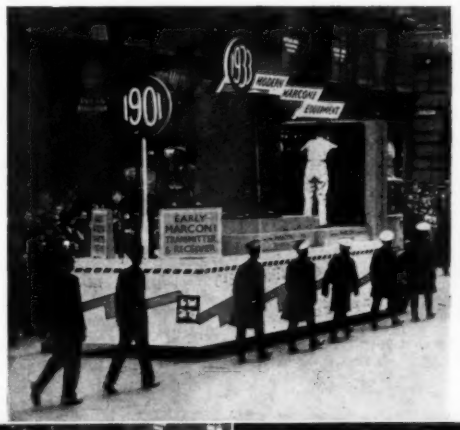
engineer concerned, the national and more important aspect was to secure the success of the grid. Until something like the estimated loads were realised the grid could not function as an economic unit nor fulfil the objects of its design.

Mr. Colyer exhibited a cinematograph film showing the construction of parts of grid lines, and the construction of towers of heights ranging to 300 ft., containing 80 tons of steel, and having a spread of 80 ft. at the base.

Safety in Works Installations

THE spirit rather than the letter of the Home Office Electricity Regulations was the subject of a paper by Mr. Fordham Cooper, one of H.M. Electrical Inspectors of Factories, which was read before the JUNIOR INSTITUTION OF ENGINEERS in London on November 3rd. The author confined himself to ordinary low-voltage apparatus with which a works engineer normally has to deal, and instanced defects and accidents which the regulations were intended to obviate.

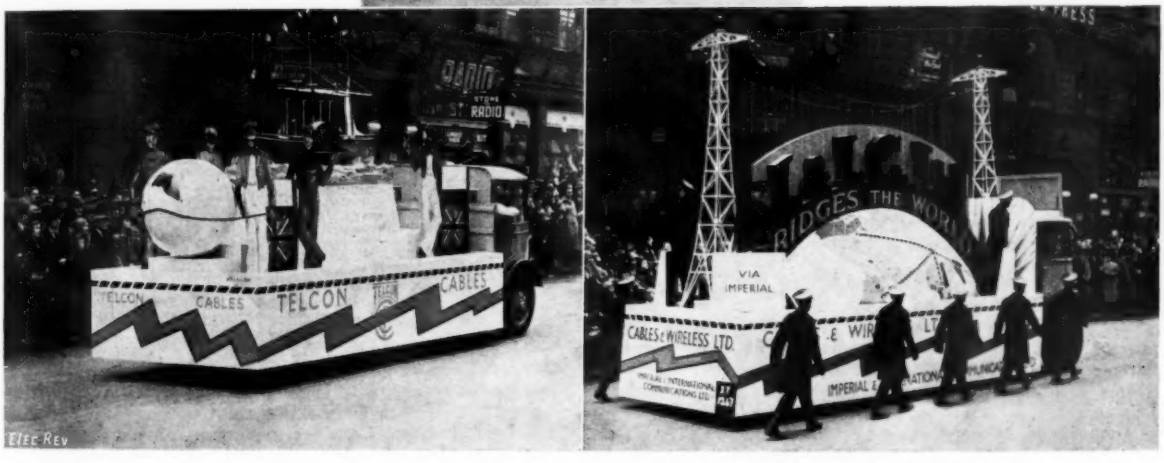
The importance of proper earthing was stressed. The total resistance of earth wires and earth plates (or their equivalent) should not exceed ½, or, at the most, 1 ohm for a piece of apparatus if it was to be really safe. The necessity for earthing the neutral or one pole of the supply ensured the proper operation of fuses and other leakage or overload protection; in the absence of an earthed neutral, capacity effects and transformer connections might produce unexpectedly high potentials under special switching conditions; it was suspected that such pressure rises had been the cause of many failures.



The sheaths of supply companies' cables could be used, but there were arguments both for and against this. Caution was necessary in using water pipes; many coming from a cistern were not earthed, and a fibre or red lead joint in the system might so break the continuity as to render a water main of doubtful value. No earth connection should be taken on trust and without test, nor should reliance be placed on one earth; there should be as many as possible. Gas pipes should never be used, and a properly laid out earthing system should be provided in the works.

It was not so well known as it should be that there were on the market a number of designs of auto-transformer, star-delta, and series-parallel starters for alternating supply which left the motor alive with the starting handle in the "off" position. On cranes it was common practice for the individual starters to break the circuit on two poles only of a three-phase supply, leaving the third pole to be dealt with by the main switch; there should be some form of isolating switch or link or a fuse box near the motor starter, which should be near the spot where the operator was working. The necessity for properly finishing off the wiring when installing a motor, &c., was emphasised, the best method being to carry conduit or armoured cables direct into properly constructed boxes or glands on the apparatus.

Some interesting notes on efficiency in illumination drew attention to the wisdom of providing a higher intensity of illumination at certain points on machinery, *e.g.*, the actual edge of the cutting tool of a lathe, the needle of a sewing machine, or the point of cut in a band-saw. Low-voltage lamps, such as are used in the interior of omnibuses, having robust filaments capable of withstanding the vibration of the machine, were useful for this purpose, and small local transformers serving, say, ten of such lamps, could be used with advantage, providing safety for the worker and an improvement in the quality of production.



Three of the tableaux seen in this year's Lord Mayor's Show: Above, Marconi's; left, the Telegraph Construction & Maintenance Co.; right, Cables & Wireless, & Imperial & International Communications

Welding for Pressure Vessels

THE first part of the paper by Mr. Robert Sulzer, which was read before the INSTITUTE OF MARINE ENGINEERS in London on November 14th, deals with the conditions which have to be fulfilled when welding is used in the manufacture of important pressure vessels.

To a certain extent electric arc welding has displaced oxy-acetylene from its original dominating position. Numerous test results illustrate this development. In addition to the testing of pieces specially prepared for judging the skill of the welder, or for comparing electrodes, welding methods, &c., the testing of finished work both by means of X-rays and by taking small test pieces is discussed particularly in the paper. Taking small test pieces at irregular intervals of time is mentioned as a method of improving the quality of the work done, and reference is also made to a number of large experimental vessels tested to rupture.

In the second portion of the paper the author surveys the progressive adoption of welding by citing examples of boilers and steam distributors, including the latest development of the tubular steam generator, hydro-electric pipe lines, and distributing pieces for connecting turbines.

The influence of annealing electric welds has been investigated and the impact tensile test introduced as a new method of testing. Annealing slightly reduces the tensile strength of the weld, but improves its ductility almost to that of the parent plate, and the reduction of internal stresses is of great advantage.

* * *

Electric Stand-by Pumping

In a paper on the re-sewerage of Guildford, by Mr. J. W. Hipwood, borough surveyor and water engineer, which was read at the PUBLIC WORKS, ROADS AND TRANSPORT CONGRESS in London on November 13th, it is explained that the plant is operated primarily by steam driven centrifugal pumps with electrically driven stand-by pumps. The main factors in favour of the use of electricity as a stand-by plant are (i) that it is instantly available, and (ii) it is supplied by a thoroughly modern undertaking belonging to the Council, and (iii) as a stand-by plant it is the cheapest form of power available. Crude oil engines would have given a lower fuel cost, but the capital charges on Diesel or semi-Diesel engines are so much greater than the capital charges for an electric motor, that when, as in the present case, the plant is used as a stand-by at infrequent intervals, the overall cost is greatly in favour of the cheaper plant even though its power cost may be higher.

A Maximum Demand Tell-tale

A DETERMINING factor of the cost of power in the majority of factories purchasing electricity from public supply mains is not so much the number of kWh consumed as the additional charge based upon the maximum power taken during some 15- or 20-minute period in the quarter. As showing how important this is, the following figures referring to a small factory in the London district may be of interest. They are for corresponding quarters of each year. It will be seen that the total kWh consumed in any quarter does not vary greatly, but during the first three no steps were taken to limit the excess kVA, whereas during the last three a "tell-tale" was installed, and this at once resulted in a reduction of the excess kVA to nearly one-half, effecting, as will be seen, an enormous saving.

Energy consumed, kWh.	Excess kVA.	Increase in price paid per kWh due to excess kVA.	
32,472	32	34%	Before installation of tell-tale.
34,522	32	33%	
39,414	42	40%	
33,200	22	23%	After installation of tell-tale.
33,820	18	18%	
31,740	16	19%	

It is evidently of the utmost importance to avoid peaks in the demand, and this can be done in nearly all cases without in any way interfering with the factory routine. The difficulty has always been to obtain "advance information" so that the necessary steps might be taken to reduce the demand within the allotted time. Attempts have been made to achieve this end by means of an ammeter or a wattmeter fitted with contacts so that a signal was given as soon as a predetermined load was exceeded.

It has been found, however, that this arrangement failed in its object owing to the fact that at certain times of day the normal maximum was almost certain to be exceeded on many occasions for short periods, without the normal "sustained maximum demand" figure being reached. Consequently, many unnecessary warning signals were given, so that they became quite meaningless and were soon ignored. Nor is a true "maximum demand indicator" fitted with a contact any more suitable, quite apart from its cost and complication, since such an instrument only gives the information at the end of the prescribed period, when, in fact, it is already too late for any corrective action to be taken.

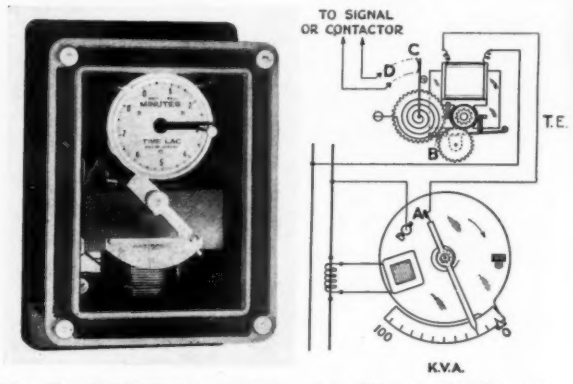
Independent Time and Load Settings

In the Everett-Edgcumbe tell-tale these difficulties are met by the provision of independently adjustable time and load settings which can be set in accordance with the particular characteristics of the load. The general appearance of the tell-tale, with its load element and its timing element combined in a single case, is seen in our illustration, the diagram showing the connections, taking the simplest instrument, *i.e.*, with a load element of the current responsive pattern. The latter may be scaled in ampères or in kVA at normal voltage, as preferred. The operation is as follows:—

Contact A is set to close at some load less than the maximum below which it is desired to keep, how far below depending upon the characteristics of the installation, such as whether the load is a fairly steady one or is liable to considerable fluctuations, and so forth. So soon as contact has been made at A the synchronous motor of the timing element TE is set in motion and simultaneously the magnetic pull exerted by the stator attracts the pivoted armature B, causing the gears to engage and the contact arm C to move forward against the spring. If this load persists during the time for which the timing element has been set, contact D will be closed and the warning given. If, on the other hand, the load falls below the setting at any time during that period, the timing element will reset itself ready for future operation. The best time setting will necessarily depend upon the characteristics of the load, but may be about half the time interval upon which the maximum demand charge is based; for example, if the latter is twenty minutes, a setting of ten minutes might well be chosen.

Contact D is usually so connected as to sound an alarm at the expiration of the predetermined number of minutes and thus to indicate that the overload has persisted for that length of time and that steps must be at once taken to reduce the load. If a suitable programme is arranged in advance to cope with such a situation, it is almost always possible to reduce the load before the expiration of the prescribed period without appreciably deranging the factory routine and with a very great saving in cost.

The load measuring element is of the induction pattern and normally takes the form of either a wattmeter or an ammeter, the latter being frequently scaled in kVA. If the power factor of the load is known approximately, a wattmeter



The Everett-Edgcumbe tell-tale, with diagram showing connections

movement can be graduated in kVA and will take all voltage fluctuations into account, while being independent within wide limits of the power factor. For most purposes, however, if the charge is based upon the maximum demand in kVA, an ammeter movement scaled in kVA will meet all requirements, the wattmeter being recommended when the charge is based upon the kilowatt demand. It may be added that the load element is provided with a pointer so that it serves to indicate the consumption in ampères, kVA, or kilowatts at all times, and if desired a flag indicator can be fitted which will show when the load for which this element has been set is exceeded.

Hot-plate Testing

TO help both supply engineers and manufacturers in arriving at some form of standardisation in the testing of cooker hot-plates the British Electrical and Allied Industries Research Association has issued a Technical Report entitled "Methods of Testing Hot-Plates" (Ref. Z/SI, price 2s. 6d.). This describes testing methods acceptable to manufacturers which are recommended.

We heartily commend the report because of its general practical character, for the extended controversy around the hot-plate during the past few years has shown the need for common sense. The tests are dealt with under four main headings, namely: Boiling time and thermal efficiency, life test, insulation resistance tests, and dielectric tests. Boiling time and thermal efficiency definitions are simple and straightforward, boiling time being that required to raise the temperature of water 85 deg. C.

Close consideration is given to the types of utensil to be employed, those for the closed flat top and radiant hot-plates, respectively, being an aluminium pan with a thick bottom machined flat to within 0.002 in., and a vitreous enamelled iron pan, while the relationship between the diameter of the bottom of the utensil and the area of the plate is clearly defined for both circular and rectangular plates.

For the life test 500 hours is stipulated, six tests to be carried out at 100-hour intervals. These sub-tests are boiling time, insulation resistance (with utensil), loading, insulation resistance (without utensil), thermal shock and mechanical shock. The thermal shock test requires ¼ pint of cold water to be released quickly on to the plate and a similar quantity of cold water to be allowed to fall slowly on to the plate in about one minute. For the mechanical shock test a hard steel bearing ball weighing about 0.25 lb. is to be allowed to drop freely six times through six inches on to such parts of the plate or its mounting as are likely to come into contact with the utensil.

The insulation resistance test provides for measurements with the plate hot, with a utensil of water boiling on it and without a utensil on it; and also with the plate cold. An appendix describes the method of measurement of the leakage current and insulation resistance recommended for these sub-tests.

For the dielectric test a pressure of not less than 1,000 V is to be applied between the heating element and the frame. With regard to the thermal efficiency and boiling time definitions we suggest that some guidance as to the initial temperature of the hot-plate would be useful, while it seems to us that the expression "maximum temperature" of the hot-plate is somewhat too vague to be really helpful. But it would be a pity for these criticisms to be considered as other than constructive.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Where Good Meter Readers Go

In this week's issue of the ELECTRICAL REVIEW Mr. F. H. Fullerton states that in Vancouver the meter department deals with 1,000 accounts a day, and that each meter reader contributes 300 readings to this amount.

Assuming the usual five and a half day (48-hour) week, a meter is read every two minutes approximately. But what happens in the cases where the lady of the house will not answer the door until a regular tattoo has been beaten on it because "she thought it was only another canvasser." In the district which I have in mind it is not uncommon to obtain only one entry for every three calls at private houses in the afternoons, through this and several other similar reasons.

Also there is the lady who wants to know all about the cheaper rates, if any, and whether the showroom stocks fires like the one installed next door. These and a variety of other causes play havoc with the "two minute reading" average in England. Vancouver must be the place where all good meter readers go.

J. A. L. READING.

London, S.E.1, *November 11th.*

Excellent lighting arrangements have been installed at the new Cockfosters Station on the "Underground" system. Our illustrations show the booking hall and the exterior of the station

Overhead Road Crossings

Mr. Roberts's letter in your issue of November 10th raises a point which is of interest to all overhead line engineers. I agree with him that there is nothing in Regulation No. 18 (2) (c) to indicate that a bridle is required and it has become quite usual practice to provide tandem pin insulators without the bridle. Nevertheless, it is interesting to note that the Commissioners do not approve of the practice which appears to be riding round a vaguely worded regulation. The suggested addition of a free bridle over the tandem insulators, although apparently meeting with official approval, does not appeal to me as sound practice. So long as duplicate insulators are considered necessary at road crossings, we should provide them in a manner which at least gives some justification for the increased expenditure, *i.e.*, side by side with a bridle.

It is to be hoped that this regulation will be clarified at the next revision of the Overhead Line Regulations, if by that time it is still considered necessary to require the provision of duplicate insulators at road crossings.

A. C. EDEN.

Old Hartford, *November 11th.*

The letter from Mr. F. R. C. Roberts in your current issue regarding the above is rather interesting, as Regulation 18 (ii) (a) distinctly states that duplicate insulators should be used at road crossings, together with some form of earth bar, but does not state that any form of duplicate conductors or bridle wires need be used.

Mr. Roberts will doubtless recollect that a few years ago most undertakers used to put a pole on each side of the road and frequently used duplicate conductors right across the road, which was an ugly and unnecessary arrangement. Then the practice of using bridle wires came into force, and as overhead line costs tended to cheapen, it was realised that a pole on each side of the road was not necessary, but that the duplicate insulators and earth bars could be on the two poles on the normal span adjacent to the road.

Certain overhead line contractors, Messrs. Pirelli, for example, have interpreted the regulations, in my opinion correctly, to the effect that only duplicate insulators and an earth bar are necessary, but when the cross-arms are of the Pirelli type, or other cross-arms where the duplicate insulators are in line with the line, instead of at right angles to it, some very queer attempts at bridling have been seen by the writer, particularly in the south-west of England. It is obvious that the bridle as fitted is merely an attempt to comply with a regulation that strictly does not appear to exist, and that it is absolutely valueless because it is not tied in to either insulator.

If Mr. Roberts wants to see an example of what apparently can be done in this country, he should take a trip into the neighbouring administrative county of Lindsey, where he will see thousands of yards of 11,000-V lines actually on the grass verge of a public road, without any earth bars or duplicate insulators. As such construction appears to be at variance with Regulation 18 (i) (a) and (b), it can only be assumed that these lines have been erected under Regulation 18 (i) (c).

H. PAYN,
Engineer and Manager, Boston and District Electric Supply Co., Ltd.

Boston, *November 11th.*

Current Transformers

I thank Mr. Thomas Ellis for his letter of November 6th, but regret that I do not fully agree with the views which he expresses. Fig. 1 represents a three-phase core-type transformer with an earth fault in the secondary circuit at point F. The concluding sentence of Mr. Ellis's letter is to the effect that the total current flowing to F is composed of positive and negative sequence components which are *in phase* and that no zero sequence component is present. Assuming the validity of this statement, fig. 2 shows the vector diagram for the currents in the secondary circuit of the transformer, the suffixes *p* and *n* denoting that a vector is in the positive or negative sequence system respectively. It will be seen that the current which must return to the neutral point *via* earth is I_R, and that the total currents in the remaining two phases

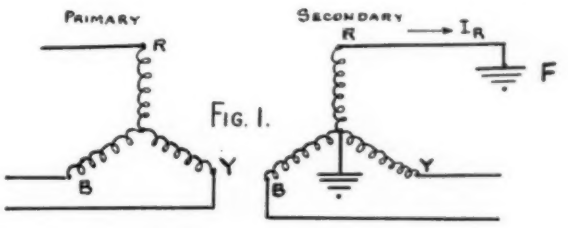


FIG. 1.

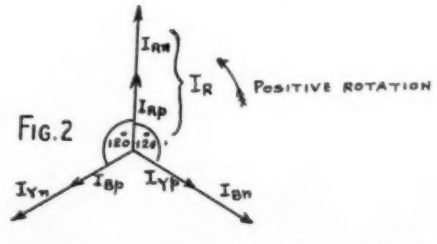


FIG. 2

are not zero. The fault conditions of fig. 1 are not, therefore, satisfied. I maintain that a zero sequence component *is* present in the secondary for a transformer of this particular construction, and that under *no* circumstances can positive or negative sequence components now in the earth.

Mr. Ellis attempts to refute my suggestion that, theoretically, the case of a core-type transformer connected as in fig. 1 may be considered analogous to that of an unearthed-star/earthed-star transformer with a tertiary winding of very high impedance connected in closed delta. Searching the available literature on this subject, the only reference I can find is on page 119 of a book entitled "Symmetrical Components" (by Messrs. C. F. Wagner and R. D. Evans) where a similar analogy has been drawn. G. A. ROBERTSON.

Fallowfield, Manchester, *November 11th.*

"Where the Therm Goes"

In the two mischievous notes bearing this heading in recent issues I have been unable to find a single sentence that is based on fact. The 2,370 B.th.u. should be 2,109 B.th.u., but it is preferable and honest to quote the actual figure supposed to be delivered at the terminals (consumer's), 3,412.

To head the notes "Where the Therm Goes," and then drift away to the coal fire which should have been abolished fifty years ago, is silly. You might at least be consistent. It is also unfair to take illuminating gas as the standard, when you know that fuel gas is the correct one.

You also know that it is both incorrect and dishonest to quote a price per unit of electrical energy, because its cost is composed of two definite and distinct items: (a) fuel; (b) all other charges. The former is dependent on the time or duration of consumption, while the latter is an equal charge per kW for every apparatus connected to the mains, which may be charged up per day, week, month, quarter, as desired or expedient. There is no such thing as "tariffs," but just these two simple items.

A unit of electrical energy (kWh) at 95 per cent. efficiency, the highest that may be allowed, gives 3,242 B.th.u. available. A good steam station should reach 0.2d. for (a) charge (a large majority are higher, and the average much so), and £3 0s. 10d. or 0.2d. per day per kW connected. Allowing usage of four hours per day, or a time factor (not load factor, because it is the time that counts) of only 16.6 per cent. we get 0.2d. plus 0.5d. or 0.7d. per unit. Just under your ¾d.

A therm of fuel gas (engineers cannot be expected to fool about with gas as now supplied—we are out for facts) contains 100,000 B.th.u. of which 80 per cent. is easily available, and more with suitable apparatus and common sense. It may be put into the mains at 1d. per therm (plus 15 to 20 gallons of oil per ton of coal distilled) and delivered at 1¼d. to 1½d., according to the length of the mains. (The gas grid is as wasteful as the electric grid.) We thus get from fuel gas 80,000 B.th.u. for 1.38d., and from electrical energy 3,242 B.th.u., or a little over twenty-four times the quantity of heat for double the cost. In addition, there are the costs of transmission, transformation and distribution. E. G. PINK.

Lee, S.E.12, *November 9th.*

[We said nothing about the coal fire in our leaderette and we were not concerned with gas "as it might be made." The thermal efficiency of Clarence Dock station is, as we stated, the kind of efficiency we may expect in the future. The average losses in transmission are 12.7 per cent., not 21.7 per cent. as appeared due to a printer's error, and 2,370 B.th.u. is correct.—EDS., ELEC. REV.]

A Warning to Contractors

Some years ago there was a person trading as a gasfitter. For some reason unknown, that person was killed by the gas companies who decided to carry out their own installation work. This will be the fate of the electrical contractor if he sits still and does nothing.

Having been in the contracting business for over twenty years, I notice that to-day more supply companies are carrying out direct installation work than ever before. I understand that there are two associations which the contractor can join, but what, if any, protection do they afford against this growing evil; and if it is allowed to continue, what will become of the thousands of contractors? E. C.

November 14th.

New Domestic Appliances

Left: A portable "Sunlamp" unit for ordinary use. Above: The "Ediswan" 1½-gal. storage water heater. Below: The "Butonook" iron, showing niche in sole for accommodating button.

WE inspected this week a variety of domestic apparatus at the showrooms of the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, W.C.2. Among other things we saw a 1½-gal. storage water heater which has been produced as the result of a call for such equipment at this year's I.M.E.A. Convention; a new iron with special provision for getting round buttons; and a recently introduced portable "sunlight" equipment for ordinary use.

The water heater has a stout sheet-steel outer casing, a heavy gauge copper inner cylinder, and a removable heavy cast-brass base plate with pockets from which the element and thermostat can be removed at any time. The 500-W sheathed-wire element is die-cast into an aluminium alloy back. An easy-wiring terminal block, a siphon-type anti-drip device and chromium-plated cold-water and pressure-reducing valves are other features. The price with a straight spout is £5 7s. 6d.

The "Butonook" iron has a niche on one side of the sole, near the point, into which the buttons on material being ironed can slide: a push-bar type switch connector moulded from heating-resisting material; an easy-grip and cool handle; a thumb-rest specially designed to take the forward thrust from the thumb; three yards of special flexible lead, double braided to prevent kinking; and a de luxe appearance afforded by the heavily nickel-plated highly polished sole-plate and cover. Priced at 15s. 6d., complete with a cord suspender, the iron weighs 5½ lb. and is loaded at 500 W.

The "Sunlamp" is available for standard a.c. voltages, and consists of a floor standard with a step-down transformer in the base. A flexible tube carrying the reflector at the top of the standard affords adjustment and focusing of the lamp. The inside of the reflector is etched aluminium. Finished in rich bronze, the equipment measures 5 ft. 6 in. high, weighs 35 lb., and costs £12 5s. complete with a lamp; a spare lamp costs £1 15s.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Improved Insulation Testing Set

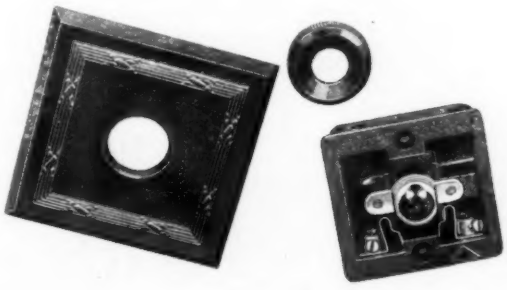
THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107, New Oxford Street, London, W.C.1, has sent us particulars of an improved "Megometer" insulation testing set, which has recently been considerably improved in design, and is now supplied in a metal case with a crystalline-enamel finish.

The "Megometer" insulation testing set

The generator, which is fitted with a slipping clutch, is of new design, and particular attention has been paid to the question of smooth running. As before, the internal d.c. resistance is 700 ohms per volt. The leather carrying strap is now fitted lengthwise on instead of across the case, and the handle has been arranged so that the instrument can be used when standing on a flat surface. The a.c. and d.c. range is 0-500 V and the price is £8. The overall dimensions are 7 in. long by 4¼ in. wide by 5¾ in. high, while the weight is 5 lb. 9 oz.

A New Flush Switch

MOULDED ACCESSORIES, LTD., 153, Great Hampden Row, Birmingham, have sent us a sample of a new moulded flush switch which has a fast make and break action, while a shield is incorporated to prevent arcing. The contacts are of phosphor bronze, and the cables enter from the bottom of the switch, thus preventing the ingress of dust or moisture. The bridge is of metal, and the depth of the switch is only ½ in. The one-way pattern costs 15s. per dozen, and the two-way pattern 20s.

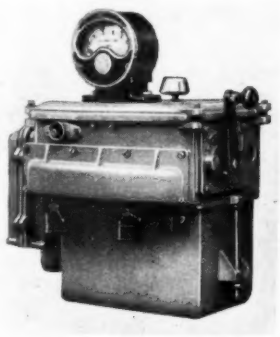


The "Moulded Accessories" flush switch

A Starter and Oil Switch

The new type "M.O." ironclad oil-immersed starter and oil switch made by MESSRS. J. G. STATTER & CO., LTD., 16, Great George Street, Westminster, S.W.1, has been designed with a view to mass production so that it can be sold at a competitive price.

Among the features of the starter are substantial controller-type contacts, individually calibrated magnetic overload releases, adjustable calibrated time lags, and a substantial stop button. Two types are available—the star-delta starter and the direct starter or oil-immersed circuit-breaker. The switch is enclosed in a metal-clad splash-proof case and the mechanism is of the free-handle type, is unaffected by vibration, and prevents the switch being held closed against overload.



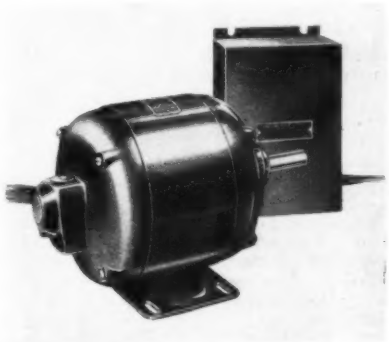
A Statter star-delta starter fitted with two overload releases, time lag, no-volt release, ammeter, and cable-sealing box

A push knob is provided for tripping the switch and the contacts are of the self-aligning type with renewable tips. A correct sequence device ensuring that the handle is first put in the "start" position and that the change-over to "running" position is effected quickly, is fitted to star-delta starters. Both types can be supplied with any combination of overload and no-volt releases, the former being calibrated from full load to twice full load. Time lags are calibrated for 0/20 sec., and the no-volt release is silent in operation and can be connected in series with a push button if it is desired to trip the switch from a remote point.

Fractional H.P. Capacitor Motors

Distinctive features are incorporated in the range of single-phase fractional horse-power capacitor motors manufactured by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby. These machines, which are virtually two-phase motors, have no brushgear or commutator, and are designed for use where really silent running is essential, such as for refrigerators and oil-burners. As the accelerating torque is higher than the maximum running torque, the motor cannot fail to run up to speed on any load that it is capable of carrying steadily.

The motors are of the capacitor-start, capacitor-run type. Their power factor and efficiency are unusually high. They are built in sizes from ⅛ h.p.



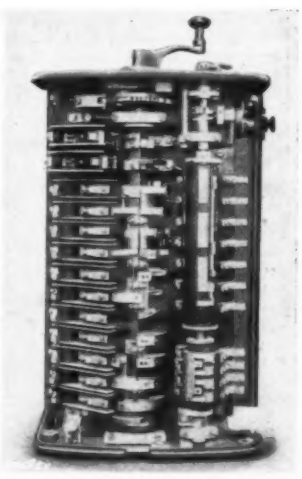
The B.T.-H. capacitor motor and unit

The rotor is of the squirrel-cage type; the stator carries a single-phase main winding and an auxiliary winding displaced 90 deg. electrically. The capacitor unit, consisting of a condenser and an auto-transformer, is connected in series with the auxiliary winding to provide a phase displacement of the current in the auxiliary winding, which to some extent gives a two-phase effect, thus allowing the motor to derive many of the advantages of a polyphase supply from a single-phase power line.

When the motor is up to speed the best running performance is obtained by adjusting the current in the auxiliary winding to its most suitable value. This is done automatically by means of a centrifugal switch with stationary contacts embodied in the motor, which changes the tappings on the auto-transformer.

Drum Controller for Tramcars

A new "Z" type drum controller with cam-operated contactors for the main arc-breaking points, has been introduced by the ENGLISH ELECTRIC CO., LTD., Stafford, for tramcars. Its special characteristics are: the provision of (1) series-parallel control of two 80-h.p. or four 40-h.p. motors in pairs at 500 V d.c.; (2) four series, four parallel and six, seven or eight brake notches, as required; (3) an internal quick-break line contactor; and (4) field shunting contacts, if required. The principal advantages claimed for the controller are: (*a*) quick-break cam-operated contactors for interrupting the current when switching from "power" to "off" and from "brake" to "off" positions; (*b*) the use of individual blow-outs on all power circuits; (*c*) a swing out arc shield; (*d*) the arrangement of the motor cut-out for operation from either inside or outside the controller; and (*e*) a brake switch which is thrown only when the controller handle is moved to the brake notches, thus reducing the wear on fingers and contacts.

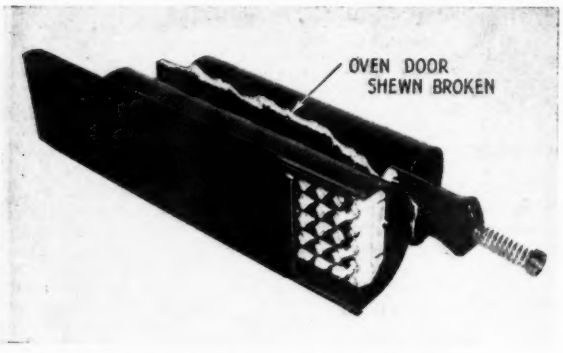


An "English Electric" drum controller

An Electrical Aid for Gas

MESSRS. GIRLINGS, LTD., Electricity Works, Maldon, Essex, have sent us particulars of a new firebar which may be attached to the door of a coal, oil or gas oven to give extra heat. The element is loaded at 1,000 W, and the firebar in which it is housed can be bolted to the oven door. The elements and the terminal box are both protected by sliding metal covers, and

the terminal box, which, incidentally, remains outside the oven door, is equipped with two 5-A insulated shielded plug

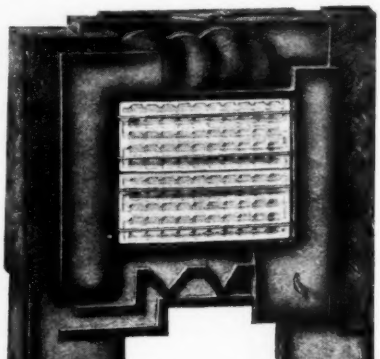


An electrical element for a gas oven

pins on the end nearest to the oven door hinges. A standard iron connector is used to connect the element to the supply.

An "Efesca" Fire

The substantial looking fire illustrated herewith is the "Select" model which is a recent product of MESSRS. FALK STADELMANN & CO., LTD., Farringdon Road, E.C.4. The finish is in rich walnut and rubbed oak, and the design reflects the modern tendency towards straight clean lines with the minimum of decoration. In all finishes the cost is 45s., with two 1-kW elements and a switch. The measurements are 18 in. high by 18 in. wide by 5 in. deep.



The "Select" fire

The B.T.-H. Type "J" Magneto

The new type "J" magneto for four- and six-cylinder engines has been developed by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, to meet the demand for a half-engine speed magneto interchangeable in its mounting with a distributor head unit. An automatic timing governor working in an oil bath is provided which serves to advance the magneto spindle relatively to the driving shaft with increase in speed. The rotating magnet runs on ball bearings and is spool shaped, supported between malleable cast-iron endplates secured by rivets to the shaft. In the four-cylinder model each endplate has two poles extending slightly beyond the middle of the rotor, their polarity sequence making four flux reversals per revolution through the armature core. The six-cylinder rotor has six poles to produce six sparks per revolution of the magneto shaft. A four- or six-point cam is secured to the upper extremity of the rotor shaft, and at the other end a driving plate engages the automatic timing governor weights.

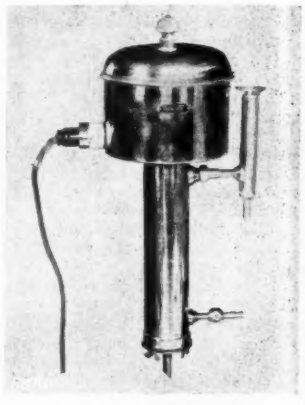
The B.T.-H. "J" type magneto and its components

The main housing is an aluminium die-casting, the upper portion constituting the contact-breaker housing, which is provided with a machined spigot for locating the distributor. Laminated iron armature poles are cast integral with the main housing and the armature windings are enclosed by a water and dust-proof cover of fabrolite. A condenser of the tubular paper design is fixed to the base of the contact-breaker housing and is connected directly across the iridio-platinum alloy contacts. The distributor is similar to that used for coil ignition equipments, and the distributor brush holder is fitted on an extension of the cam.

An Automatic Still

A new automatic still is being marketed by MESSRS. MELVIN, LTD., 17, Leighton Place, Kentish Town, N.W.5. Two sizes are available, one with an output of 4 pints per hour and loaded at 1,500 W, and the other with an output of 5½ pints, loaded at 2 kW. All other features are common to both models.

The body of the still is of polished copper, heavily tinned inside, and the boiler is seamless and in one piece. Three wing nuts at the bottom of the condenser enable it to be removed easily, and the condenser tube to be withdrawn. A safety switch ejects the plug should the still boil dry, and it cannot be replaced until the water supply has been restored.



An automatic still

Steam loss is avoided by a water sealed joint round the lid, and while the incoming water cools the outgoing steam in the condenser, it is itself warmed up before reaching the pan. The small model costs £6 13s. 6d., and the large £7 15s.

A New "Henley" Departure

This week sees a newcomer to the domestic appliance field—W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C. The company has, of course, already been selling a small soldering iron suitable for home use, but this is strictly a workshop not a "domestic" appliance. The new device is a waffle baker (or iron), the grid portion of which is encased in chromium-plated steel. The base portion is of cast iron vitreous-enamelled in any one of four colours—blue, orange, green and "natural." A length of Henley three-core t.r.s. cable is provided with a combined plug and lamp adaptor. The loading is 400 W and all standard voltages are catered for. The equipment includes a grid-cleaning brush and a greasing brush. The price is 32s. 6d.

The "Solon" waffle baker

The millboard case in which the "Solon" waffle baker is packed also contains a recipe book and six neat cards enabling the purchaser to send invitations to a "waffle party" to her friends.

A Motor-car Insulation Tester

Electrical leakage is usually preceded by a period of poor insulation, and advantage can be taken of this fact to locate weak circuits before faults actually occur and cause trouble. An instrument marketed by the RUNBAKEN MAGNETO CO., LTD., 3, Furlong Road, N.7, is suitable for testing the insulation of motor-car lighting circuits, either of 6 or 12 V. It is self-contained in a machined aluminium case built to withstand rough usage, and provided with a carrying strap. Inside is a 100-V magneto generator operated by a small handle, and the moving-coil indicator is of the dead-beat pattern and fitted with a zero adjuster. The scale is calibrated from one megohm to infinity and is also marked "good," "medium," and "poor" to facilitate tracing leakages too small to cause failure, but sufficient to drain the car battery. This tester is also useful for checking the insulation of car dynamos, starters, and other electrical gear after repairs, as well as lighting and power circuits generally. The instrument is easily portable as it weighs only 10 lb., its dimensions being 5.5 in. by 4 in. by 5 in., and its price £6 10s.; a leather carrying case costs 10s. 6d. extra.

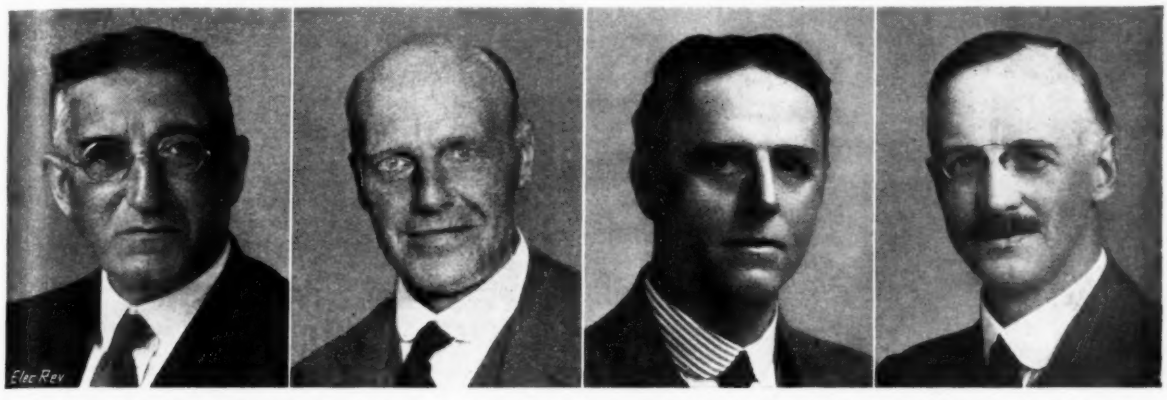
Progress in Electricity Supply

The thirteenth annual report of the Electricity Commissioners

THE thirteenth annual report of the Electricity Commissioners covers the twelve months ended March 31st, 1933. The figures of output detailed relate to the calendar year ended December 31st, 1932 (in line with the fuel returns reviewed in our issue of July 7th). The total kWh generated in the 474 power stations of authorised undertakers amounted to 12,248 million; adding the output of forty-seven stations of railway, tramway and certain non-statutory undertakings, the grand total was 13,656 million.

alter their declared systems mostly to a.c. 50-cycle 400/230 V. Approvals to multiple earthing have been given to nine undertakings during the past four years. Attention is drawn to the High Court judgment (Lakeman *v.* the Corporation of Chester) which laid down that an undertaking was responsible for putting the consumer into the same position with a.c. as he was with d.c., including compensation for any loss incurred in consequence of the change-over.

Reports from undertakings with overhead systems were



The Electricity Commissioners: From left to right—Sir John F. C. Snell, G.B.E. (*Elliott & Fry*) (chairman), Sir John R. Brooke, C.B. (vice-chairman), Mr. T. P. Wilmshurst, M.B.E. (*Winter, Derby*), and Mr. W. W. Lackie, C.B.E. (*Elliott & Fry*).

The capacity of private generating plant installed in industrial works in 1930 amounted to 2,833,000 kW (nearly 40 per cent. of that of public undertakings) and of motors to 10,244,000 h.p. (including 6,000,000 h.p. driven by purchased electricity); there was also 6,700,000 h.p. for direct mechanical drives. The electrical requirements in industry in 1930 amounted to 1,022 kWh per h.p. installed.

The number of separate undertakings was 650, a decrease of ten from the preceding year; these comprised 267 companies, 376 local authorities, five joint boards, and three Joint Electricity Authorities. In 1932 thirty-seven stations were closed, three new stations and one temporary station were commissioned; with sixteen existing stations which became part of authorised undertakings the net decrease from the number included in the previous return was seventeen. Sales by authorised undertakings to consumers in 1932 amounted to 10,097 million kWh, an increase of 710 million, or 7.5 per cent. over 1931, and representing 224 kWh per head of the then estimated population.

Extensions Sanctioned

Sanctions were given to the installation of 66,073 kW in power stations (701 kW in new stations), bringing the total, under consents given since January 1st, 1920, up to 6,245,285 kW (1,137,727 kW in new stations); the annual average of the past twelve years has been 515,000 kW. The principal consents applied to 30,000 kW at Brighton, 7,500 kW at Brimsdown, and 10,000 kW at Willesden. Consent was refused to an extension of the Falkirk station. Special Orders were made in thirty-three cases relating to the establishment or extension of distribution undertakings; the total number of applications since the beginning of 1920 has been 796. Fringe Orders granted during the year numbered 114 and those revoked twenty-four. Sanctions to borrowing (apart from applications by the Central Electricity Board) were issued in 840 cases to the extent of £14,225,796. The amount allocated to mains and services was less by £355,000 than in the previous year. The amount sanctioned since January 1st, 1920, for apparatus and wiring for hire and hire-purchase has been £5,691,000. The number of bulk supplies taken and arranged was 526, apart from eighty-five from the C.E.B.

Non-standard Cables

Two approvals were given to non-standard systems of supply. The first, to Bedford Corporation, concerned the use up to 33 kV of lead-sheathed cables covered with jute or preservative compound and laid direct in the ground; the other was to the Minehead Electric Supply Co., Ltd., for the use of twin-concentric or three or four-core l.c. 2,200-V mains, with the external conductors earthed at the generating station or sub-station, the neutral point of the 11-kV system being earthed at the main sub-station and the external conductor of concentric distributors being earthed to the armouring at each house. Consents were given to thirty-three undertakings to

received in relation to the blizzard which occurred on February 24th, 25th and 26th. A notable feature was the formation of substantial loadings of snow and ice on the conductors, which attained diameters up to 5 in.; maximum wind velocities observed were 54 m.p.h. steady, and 73 m.p.h. in gusts, with minimum temperatures of 30 deg. F. Damage was caused by: (1) weight of snow, &c., on conductors, coupled with pressure and gusty character of the wind; (2) accumulation of snow on insulators and other apparatus; (3) the falling of Post Office lines and posts; and (4) the blowing of trees and other extraneous objects into contact with the lines. The falling of the P.O. lines and posts was responsible for the major portion of the damage. The high-voltage lines suffered far less than the lower voltage.

Interference with wireless reception by the operation of electrical apparatus receiving energy from public supply systems is often due to the faulty maintenance of motors, many of which are hired, and the Commissioners are conferring with the engineers of the undertakings concerned. The Postmaster-General agreed to make it a condition of granting licences for wireless exchanges that the applicants should be liable for guarding their overhead lines when they are second comers.

Elliott & Fry

Mr. H. Nimmo, M.I.E.E., M.I.Mech.E., chief engineering inspector to the Electricity Commission

The Minister of Transport approved the erection of overhead lines in 2,462 cases (an increase of about 12 per cent. on the previous year) and had given his consent to 220 compulsory wayleaves. Eleven claims for compensation on account of loss of office due to the closing down of generating stations were settled.

The staff of the Electricity Commission numbered eighty. The net cost of administration for the year 1932-33 was £48,000, a reduction of £2,500 from the preceding year. In addition the amount of £333,000 was refunded to the Central Electricity Board, being expenses incurred in frequency standardisation. These amounts are repayable by the authorised undertakings, on the basis of kWh sold, in the first case, and on the basis of revenue received, ignoring sales in bulk to other undertakings, in the second.

Rural Demonstration Schemes

Several pages are devoted to the Bedford and Norwich rural demonstration schemes. The Bedford scheme was inaugurated on April 1st, 1930. The tariff embodies a two-rate tariff, the lower component coming into effect after a specified

consumption, based on the net annual value of the premises, has been reached. At March 31st, 1930, there were 3,425 consumers, the increase over the previous year being 1,068, principally domestic. Over 61 per cent. of the occupied dwellings in the area have been connected. KWh sold amounted to 3,639,696, of which 42.5 per cent. was taken by houses and shops, 4.8 per cent. by farms, and 52.7 per cent. by power consumers. The revenue per kWh was 1.218d. (1.96d. domestic and shops), a reduction of 8 per cent. from the previous year. The cost of the energy was £3.288 per kW and 0.189d. per kWh.

The capital expenditure of £190,278 included £139,580 for mains and services, £19,253 for sub-stations, and £20,760 for apparatus and wiring. At the end of March, 1933, consumers were hiring or hire-purchasing 860 cookers, sixty-one washboilers, forty-five storage water heaters, and 657 wiring installations. There was a net deficit of £2,607 on the accounts, which was anticipated in the early stages of the scheme.

The Norwich scheme which was initiated in November, 1930, is more definitely rural in character than the Bedford, the 1,634 consumers connected at the end of last March including 1,266 domestic, 127 farms, and only two factories. About 76 per cent. of the domestic consumers occupy premises having a rateable value of less than £10 per annum. Of the 2,817 kW connected, 547 were for lighting, 2,055 for heating and cooking, and 215 for power. Above two-thirds of the kWh sold (501,000, an increase of 138 per cent. over the previous year) was taken by domestic consumers. The average revenue was 2.233d. per kWh (2.19d. domestic). The cost of energy was £2.74 per kW and 0.16d. per kWh.

Capital expenditure amounted to £90,162, and included £67,200 for mains and services, £8,731 for sub-stations, and £9,577 for apparatus and wiring. There was a net deficit of £3,195.

Committee "D": The Last Rites

ALTHOUGH in its passing the Fair Trading Committee (Committee "D") set up under the 1926 Act has been "unwept, unhonoured and unsung," having in the opinion of many been an unconscionably long time a-dying, the individual members of that Committee deserve the highest praise for their unselfish devotion to what has proved (temporarily at least) a hopeless cause. Particular credit is due to the work of the chairman, Mr. F. W. Purse, who has guided the Committee's deliberations with great tact and patience in many a weary meeting. It is not for lack of trying that full agreement between the warring factions has not been attained.

To mark their appreciation of Mr. Purse's untiring efforts and (shall we say?) to "celebrate" the end of their labours,

Traffic lights and signals were a prominent feature of the Public Works Exhibition, dealt with on page 696 of this issue. The picture shows the stands of the Automatic Electric Co., Ltd., and Gowshall, Ltd.

members of the Committee gathered at luncheon last week and during the function presented Mr. Purse with an inscribed gold cigarette case.

In making the presentation, Mr. H. H. Berry, who presided at the luncheon, said that every game had a code of rules, but the electrical industry was lacking in this respect; it had no code of ethics for its guidance. Committee "D's" work had been an attempt to remedy this state of affairs and to produce a fair trading policy which should be the "corner stone of prosperity" for the industry.

In acknowledging the gift, Mr. Purse said that this was one of the happiest functions he had attended during the course of a long public life, and he could not imagine anything in the future which would give him greater pleasure. It was evident that, notwithstanding the disciplinary measures which he had at times been compelled to take, he had retained the esteem and goodwill of the members of the Committee. He would treasure the gift as a memento of the happy and strenuous times they had spent together in hammering out the principles of a fair trading policy, which he hoped would have far-reaching effects. He said that some supply authorities were not yet reconciled to a fair trading policy. The basis of all their objections seemed to be that the electrical industry should not be subjected to a measure of control. It seemed strange to him that trade union principles were right for the employés but not the employers.

Mr. Purse then proceeded to show how other national or local services had been subjected to control, which had resulted in a large measure of success, and he cited the Port of London Authority, the Metropolitan Water Board, and the London County Council, and, more recently, the Traffic Commissioners, the Central Electricity Board, the B.B.C., the London Passenger Transport Board, the Milk Marketing Board, the Hops Marketing Board, and the Pigs and Bacon Marketing Board. Those bodies were not set up to raise prices but to co-ordinate and plan the various services, cut out insane competition, and to ensure fair prices and proper service. He also quoted a large number of instances where articles were sold at recognised fair prices.

In proposing the toast of "The Fair Trading Council," Mr. W. Finlay, secretary to the Electrical Contractors' Association of Scotland, said that the function had been referred to as the "burial" of Committee "D." Having cremated the body it was his opinion that there would arise from the ashes a phœnix which would exert such an influence as would unite all sections of the industry in a "Fair Trading Commonwealth." The electrical industry was the youngest industry, and it must learn to be controlled so that each man might receive a fair reward for his labours.

"National Recovery" in America

OUR New York contemporaries still carry the N.R.A. membership badge but they do so blushingly. They are far from easy in their minds. The *Electrical World*, for example, comments upon the many changes of these stirring times, and regretfully quotes the fact that new textile plants cannot be built without getting the permission of N.R.A. "In other words—contemplate the picture!—hereafter we must ask the Government if we can go into business." "What," our contemporary asks, "does this policy do to revive the capital goods industry?"

Meanwhile, slow-speed ahead seems to be the attitude toward the N.E.M.A. code. Some of the electrical supervising agencies were appointed at the end of last month, but some of the new price lists in circulation had a "too-prevalent plus 10 per cent. new price." Certain branches were not in a hurry to submit price lists, preferring to let the other fellow do it first. Misconceptions regarding uniform prices exist, as was expected would be the case, but our contemporary says, with little originality, that no industry can reorganise itself in a brief period, though it puts as good a face as it can on things by adding that "on the whole encouraging progress is being made." N.R.A., it is stated, has not failed "one assumes," but "is meeting an inevitable test of strength and ability to be continued."

Indications of the effect of the times on the big electrical manufacturing companies may be found in figures issued by the Westinghouse Electric and the General Electric Companies. Larger business is being done but the former made a net loss of $1,513,645 for the third quarter, and one of $2,078,424 in the previous quarter; in the third quarter of 1932, however, the loss was $2,715,123. The General Electric has added 7,600 employés since March 1st, and the total pay-roll rate was $17,000,000 per annum greater than at that date. President Gerard Swope says that N.R.A. requirements have necessitated little change in the General Electric Co., for the maximum working week since May 1st has been only forty hours, and there were few employés whose pay was at a lower rate than that prescribed by the Code.

In the Courts

THE House of Lords on November 9th delivered judgment dismissing the appeal of the St. James' and Pall Mall Electric Light Co., Ltd., from the judgment of the Court of Appeal allowing the appeal of the City of Westminster Assessment Committee from the judgment of a Divisional Court of the King's Bench.

The company claimed that the gross and rateable value of its buildings, machinery, mains and appurtenances for the supply of electricity should be reduced to £72,664 gross and £36,000 rateable, account being taken of sinking fund payments which the company has to provide annually under the London Electricity (No. 2) Act, 1925, providing for the transfer of the company's undertaking to the London & Home Counties Joint Electricity Authority in 1971.

The Divisional Court upheld this contention, holding that in arriving at the rateable value of the undertaking on a profit basis the sinking fund payments must be deducted from the profits since a hypothetical tenant would not pay a higher rent to collect revenue from which he could derive no benefit. The Court of Appeal, however, reversed that decision, holding that sinking fund payments to return capital to shareholders were not to be deducted for rating purposes. From this decision the company appealed.

Lord Atkin, giving judgment, said that in his opinion the Court of Appeal was right in deciding that the amount which the company was required to set aside for the sinking fund should not be excluded from its receipts or allowed as a deduction therefrom. The amounts in question had nothing to do with the expenses of earning the gross receipts or with receipts. They were irrelevant to the calculation of rent on the profit basis or indeed on any basis. He thought that the appeal failed and should be dismissed. The other members of the Court concurred.

Alleged Passing-off

In the Chancery Division on November 10th before Mr. Justice Luxmoore, Mr. H. King on behalf of Mr. Frank D. Winslow applied for an interim injunction against Francis Hayden and Albert Pratt to restrain an alleged passing-off and breach of copyright. Mr. King said that the plaintiff was seeking to restrain the defendants from selling or offering for sale or disposing of fittings not of the plaintiffs' manufacture designed to prevent interference with wireless reception under the name of "Radio Inductor" without clearly distinguishing them from the plaintiff's goods. It was further alleged that the defendants had issued a box leaflet similar to those of the plaintiff.

Mr. Edwards, who appeared for the defendants, said they were willing to treat the motion as the trial of the action and to submit to certain injunctions. The plaintiff waived any inquiry as to damages and did not ask for costs.

His Lordship granted the injunctions and agreed to the terms mentioned by Counsel.

Sterling or Australian Currency?

The hearing was continued in the House of Lords on November 9th of the appeal by the Adelaide Electric Supply Co., Ltd., from the judgment of the Court of Appeal dismissing its appeal from the judgment of Mr. Justice Farwell in the Chancery Division granting a declaration that the plaintiffs, the Prudential Assurance Co., Ltd., as the holders of £11,000 5 per cent. "A" cumulative preference stock and £30,000 6½ per cent. "C" cumulative preference stock of the company, and all other holders on the English register of the company of those stocks, were entitled to be paid their dividends in full in sterling and in England and not as the Adelaide Co. contended in Australian currency or its equivalent.

Mr. W. P. Spens, K.C., following Sir William Jowitt, K.C., for the respondents, said that the appellant company was incorporated in England under the English Companies Acts and the contract between the parties must be governed by English law. Accordingly the dividends wherever payment of them was made must be assessed and measured by an English standard. The "A" and "C" preference stocks were issued in England and the subscriptions were made to the Adelaide Co. in English currency. He submitted that the company's resolution to pay in Adelaide in Australian currency could not affect the appellants' obligation to pay the English stockholders in English money.

Mr. Wilfrid Greene, K.C., in replying for the appellants, contended that the respondents were bound by the regulations of the Adelaide Co. requiring that dividends should be declared in Australia and paid in and from Australia.

Lord Russell of Killowen said it was a contract under which dividends were paid for years in English currency. When a resolution was passed to pay the dividend in Australia that simply shifted the place of payment of the same dividend. Lord Wright agreed that this was the crux of the case.

Mr. Greene said that if the respondents were right the contract was to pay English legal tender in Australia. He submitted that that could not have been the intention.

At the conclusion of the arguments on November 10th their Lordships reserved judgment.

Another "Sterling" Case

The hearing was commenced on November 10th in the House of Lords before Lords Atkin, Warrington of Clyffe, Tomlin, Russell of Killowen, and Wright, of an appeal by Mr. Joshua Feist from the judgment of the Court of Appeal affirming a judgment of Mr. Justice Farwell in favour of the Société Intercommunale Belge d'Electricité. The appellant was the holder of a £100 bond, part of a series issued in September, 1928, by the respondents, a Belgian company. Each bond provided for the payment of £100 on September 1st, 1963, or such earlier day as the principal moneys thereby secured became payable under the endorsed conditions, and all interest during the continuance of the security at 5½ per cent. per annum in "Sterling in gold coin of the United Kingdom to the standard weight and fineness existing on the last day of September 1st, 1929." Condition 18 of the bond provided that the bond should be construed and the rights of the parties regulated according to the law of England and as a contract made and according to the terms thereof to be performed in England.

Mr. Justice Farwell held that the contract was not a contract for the delivery of bullion but imposed an obligation to pay a debt with interest, and that as bank notes were made legal tender by the combined effect of the Bank of England Act, 1833, and the Coinage Act, 1870, any indebtedness could be satisfied by payment in bank notes. The Court of Appeal affirmed this decision.

Sir William Jowitt for the appellant said that the bond in the present case bore the date September 1st, 1928, and was part of £500,000 issued by the respondents. The form adopted for the gold clause was literally to make the obligation one to pay in gold coin of the United Kingdom. He submitted that the Court of Appeal and Mr. Justice Farwell had wrongly declined to give that reasonable construction to the clause.

He contended that on the proper construction of the clause Mr. Feist was entitled to a declaration that the respondents should pay him in gold of the United Kingdom to the appropriate amount of or equal to the standard of weight and fineness existing on September 1st, 1928, or alternatively to a declaration that they were bound to tender him such a sum in sterling as might be sufficient to purchase in the market on the day of payment gold of not less weight and fineness than that contained in the gold coin of the United Kingdom as would suffice to discharge such payment if falling due on September 1st, 1928.

At the conclusion of the arguments for the appellant, Mr. Gavin Simonds supported the judgment of the Court of Appeal on behalf of the respondents, contending that the company could discharge the debt in any legal manner.

The further hearing was adjourned to yesterday (Thursday).

Parliamentary News

(BY OUR SPECIAL REPORTER)

IN the House of Commons on November 8th, Mr. McEntee asked the Minister of Transport whether any scheme had yet been submitted to the Standing Joint Committee of the London Passenger Transport Board by the North Eastern Railway Company for the electrification of its suburban lines.

Mr. Stanley said that the Standing Joint Committee had before it a number of proposals for new works, including a scheme for the electrification of the Great Eastern section of the L.N.E.R.

A Latvian Contract

On November 13th Mr. Hannon asked the Secretary to the Department of Overseas Trade if he would state what communications had passed between his department and British firms in a position to tender for the construction of the hydro-electric power station upon the river Daugava, in Latvia.

Mr. Colville said that the terms of communications between the Department of Overseas Trade and firms were necessarily confidential, but whenever a real prospect of remunerative business arose, it was at once brought to the notice of British manufacturers through the usual channel.

Payment for Wireless Licences

On November 15th Mr. Glossop asked the Postmaster-General if he was aware of the difficulty which many persons were having in finding a lump sum of 10s. for the renewal of their wireless licences; and whether he would consider the introduction and sale of wireless licence stamps of a value of 6d. each so as to enable twenty such stamps to be bought in advance of the date of renewal which would be accepted in payment of a licence.

Sir Kingsley Wood said that facilities suitable for this purpose were provided by the Post Office Savings Bank.

Cheap Foreign Automobile Lamps

On November 14th Lieut.-Col. Acland-Troyte asked the President of the Board of Trade, whether he was aware that foreign electric-light bulbs for side and tail lamps of motors were sold wholesale in this country for 2s. 6d. per dozen, whereas the home-made article cost 11s. 3d.; that the retailer made a profit of 3¾d. per bulb on the foreign article against 2d. per bulb on the British-made article; and whether any application had been made to the Imports Advisory Committee for a higher tariff to be placed on imported electric-light bulbs.

Mr. Runciman said that foreign electric light bulbs, which were component parts or accessories of motor vehicles, were subject to an *ad valorem* duty of 33⅓ per cent. under Section 3 of the Finance Act, 1925. As these articles were not dutiable under the Import Duties Act, they did not fall within the purview of the Import Duties Advisory Committee.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

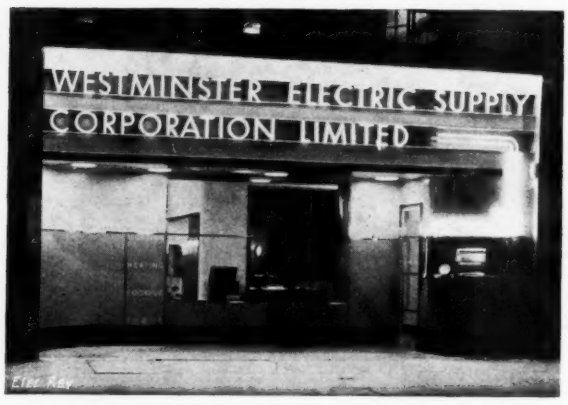
Our Overseas Trade in October

The Board of Trade Returns of Great Britain's imports and exports in so far as they affect the electrical industry are dealt with in the table on this page. Below we analyse the exports of electrical machinery during the month. It will be seen that there was a slight decrease in the total tonnage and value as compared with October, 1932, but on the whole the figures may be considered satisfactory. Japan's small share showed a slight rise, and there were improvements in shipments to South America, British India, and "other countries." The best feature was the substantial increase in South Africa's purchases, reflecting, no doubt, the recent improvement in the gold-mining industry. The greatest decrease occurred in the case of Canada, but this is a market showing very wide fluctuations.

	Quantities. Tons. Oct., 1933.	Inc. or dec. compared with Oct., 1932.	Values. £ Oct., 1933.	Inc. or dec. compared with Oct., 1932.
European countries	279	−376	61,201	−25,824
Japan	—	—	224	+ 26
South America	103	+ 51	12,521	+ 2,141
South Africa	460	+338	61,210	+37,806
British India	349	+ 21	38,927	− 9,798
Australia	57	− 27	10,202	− 1,066
New Zealand	33	− 14	5,033	− 3,625
Canada	15	− 74	3,244	− 6,095
Other Countries	303	+ 53	42,552	+ 1,308
Total	1,599	− 28	£235,114	−£5,127

Non-reflecting Showroom Windows

A feature of the showroom of the Westminster Electric Supply Corporation, Ltd., in Victoria Street, S.W., which has recently been reconstructed, is a reflectionless window so designed that undesirable reflections are lost to view. This window is a concave sheet of glass designed so that the rays of light falling upon the surface are always reflected away from the eye. At the top and bottom of the shop-window are arranged baffle boards, the surfaces of which are prepared in dead black, and upon which the rays of light reflected from the window fall and are absorbed. As will be seen from the accompanying illustration, the impression gained is that there is no glass, allowing a clear view to be obtained of the window display and the showroom beyond. The window was made by Messrs. Pollards, 159, St. John Street, E.C.1, who have also recently installed a similar window in the Streatham showrooms of the County of London Electric Supply Co., Ltd.



A non-reflecting window at the Westminster Supply Corporation's showrooms

Sign Trade Activity

It is pleasing to learn that there is increasing activity in the electric sign business of the Brilliant Sign Co., Ltd., of 131, Uxbridge Road, Shepherd's Bush, W.12. We hope that it may be regarded as one indication of the general improvement in trade. The company and its subsidiaries report that they are busier than at any previous time during their fifty years' existence. Overtime and double shifts are being worked in the mill section and the neon department. An order for 40,000 of their process stamped copper gilded and coloured hanging signs advertising cigarettes has just been booked.

"Helping the Contractor"

Philips Lamps, Ltd., are offering the services of their illuminating engineers without charge to assist contractors with lighting problems. For their further guidance the company has issued a new catalogue of commercial and industrial fittings of a size suitable for the pocket. Each fitting has been shown against a background which gives some idea of its appearance when installed; and prices and alternate types are clearly indicated. Reproductions of photographs of representative lighting installations are also included.

French Import Quotas

The French *Journal Officiel* has published a series of orders fixing the quotas for the import of certain goods into France during November and December. According to the *Board of Trade Journal* these include the following:—Dynamo-electric machines, industrial transformers and current rectifiers, 5,375 quintals (United Kingdom share, 430). Apparatus for cutting-off, regulating, protecting and distributing electric current, including distribution cables: (*a*) non-automatic apparatus, 1,459 quintals (United Kingdom share, 191); (*b*) automatic apparatus, 1,253 quintals (United Kingdom share, 356). Electric measuring apparatus, except meters covered by tariff No. 505, 97 quintals (United Kingdom share, 13). Transformers for above, 25 quintals (share of "other" countries, including United Kingdom, 0.6). Electric heating apparatus, including electric stoves, 825 quintals (share for "other" countries, including United Kingdom, 184).

An Empire Directory

The 1933-34 edition of the British Empire Trades Index, published by Business Dictionaries, Ltd., is now available. This directory contains classified trade lists of principal business houses in the British Empire, with their cable, postal addresses and telephone numbers. It is divided into three sections, the first being a classified trades list, the second an alphabetical index to firms, and the third an alphabetical list of trade marks, brands, &c.

British Overseas Electrical Trade in October

	Exports. Electrical exports for Oct., 1933.	Inc. or dec. as compared with Sept., 1933.	Inc. or dec. as compared with Oct., 1932.	Imports. Electrical imports for Oct., 1933.	Inc. or dec. as compared with Sept., 1933.	Inc. or dec. as compared with Oct., 1932.	Re-Exports. Electrical re-exports for Oct., 1933.	Inc. or dec. as compared with Sept., 1933.	Inc. or dec. as compared with Oct., 1932.
Insulated wires and cables ...	£120,192	+ £12,701	+ £20,547	£22,293	+ £ 757	− £1,733	£150	− £12	− £ 14
Electric carbons	2,876	− 1,620	− 501	10,551	− 753	+ 1,588	17	+ 7	+ 3
Arc lamps and searchlights ...	259	− 1,984	− 199	38	− 34	+ 38	57	+ 55	+ 57
Incandescent lamps ...	35,364	+ 761	− 4,578	14,336	+ 119	− 9,008	990	+ 91	+ 625
Other lighting apparatus ...	27,438	+ 1,875	+ 980	35,015	+ 3,952	+ 8,131	2,247	− 70	+ 472
Batteries and accumulators ...	58,642	− 20,031	+ 1,443	1,551	+ 872	− 5,100	34	− 24	− 84
Meters and instruments ...	20,475	+ 1,347	− 1,901	21,467	− 4,349	− 2,955	171	+ 78	− 209
Unenumerated electrical goods and apparatus	93,899	+ 17,522	− 63	50,599	+ 11,395	− 17,733	2,730	− 11	− 2,077
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	19,695	+ 2,410	− 10,614	320	+ 188	+ 148	—	− 12	− —
Submarine telegraph and telephone cables	34,162	+ 32,802	− 71,230	9	− 38	+ 9	—	—	—
Telegraph and telephone apparatus	201,651	+ 29,481	+ 44,150	121,367	− 1,734	− 14,381	1,789	− 821	− 2,200
Electrical Machinery—									
Railway and tramway motors	3,735	− 721	+ 3,241	—	—	—	—	—	—
Other motors and generators	102,811	− 16,689	+ 12,297	—	—	—	—	—	—
Unenumerated electrical machinery	128,568	+ 17,498	− 20,665	18,999	+ 734	− 9,846	2,161	− 1,507	− 3,302
Total	£849,767	+ £75,352	− £27,093	£295,515	+ £11,109	− £50,842	£10,346	−£2,226	− £6,729
Decrease for the first ten months of the year... ...	Exports. £272,469			Imports. £424,409			Re-Exports. £52,743		

Recent Contracts

The English Electric Co., Ltd., has received a contract from the Leeds Corporation covering switchgear and transformers for the Whingate sub-station comprising a 24-panel, 6,600-V metalclad switchboard of 350,000-kVA rupturing capacity, and four 6,000-kVA 3-phase power transformers with remote controlled on-load tap changing gear. In addition the contract covers a number of 11-kV oil-immersed isolators, a four-pillar metalclad switchboard with neutral earthing, a cubicle type control board, and auxiliary apparatus such as battery, battery board, motor generator set, oil filtering plant, &c. The value of this contract is in the neighbourhood of £34,000.

The company has also received an order from the Kettering U.D.C. for switchgear for the new station giving the electricity supply to the new mill of Messrs. Stewarts & Lloyds at Corby. The contract includes a 33,000-V outdoor-type sub-station controlling transformer and feeders with switchgear of 500,000 kVA rupturing capacity remote controlled, together with structures, foundation work fencing, floodlighting, &c.; and a seven-unit 11,000-V metalclad switchboard having a rupturing capacity of 250,000 kVA, together with auxiliary switchgear for lighting and heating, &c. In parallel with this order the company has received a contract from Messrs. Stewarts and Lloyds for the 11,000-V metalclad switchgear required for their new mill; this contract covers thirty-five units in all for installation in seven sub-stations. This gear will have a rupturing capacity of 250,000 kVA. Messrs. Stewarts & Lloyds have also awarded the company a contract for sixteen transformer units. The value of the last three contracts is approximately £33,000.

Another order booked by the company is one from the Central Electricity Board for its sub-station at Kettering for a 10,000-kVA 33,000-V transformer.

Britannia Batteries, Ltd., has secured a contract from the General Post Office for replating two 10,000-Ah and two 300-Ah batteries at Marlborough telephone exchange, and two 2,250-Ah batteries at Bell Exchange, Glasgow.

Siemens Electric Lamps & Supplies, Ltd., have received an order from the Barrow Barnsley Main Collieries, Ltd., Worsborough, for cable, accessories and lamps.

Messrs. H. Lees & Co., Ltd., Glasgow, have received an order from the London & North Eastern Railway for the erection of an electrical coaling plant for locomotives at Boston. The L.N.E.R. now has thirty-three electrical coal-handling plants in operation or under construction.

The General Electric Co., Ltd., announces that in connection with the electrical work which is being carried out at King William's College, Castletown, Isle of Man, it has secured orders for 12,000 yds. of Pirelli-General cable, 10,000 ft. of "Magnet" conduit with "Silverlac" fittings, 500 lighting fittings, and a number of "Witton" motors for the various workshops.

Ransome's Trolley-buses

We are informed that both the complete trolley-bus exhibited by Ransomes, Sims & Jefferies, Ltd., at the recent Commercial Motor Show as well as the chassis built by them and fitted with a Brush body had a traction motor of special lightweight design and Ransomes own manufacture.

A "Creda" Fire Display

The accompanying illustration shows a display of "Creda" fires in the windows of the North-Eastern Electric Supply Co., Ltd., Newcastle-on-Tyne, and is an excellent example of one of the types of window displays which the Simplex Electric Co., Ltd., has arranged this season.

A "Creda" fire display in the windows of the North-Eastern Electric Supply Co.

New Electricity Showrooms

New electricity showrooms at Ormskirk have been opened jointly by the Lancashire Electric Power Co. and the Ormskirk Electric Supply Co. Mr. C. D. Taite and other members of the executive escorted members of the Ormskirk U.D.C. round the showrooms on November 9th.

At a meeting of Colchester Town Council on November 9th Ald. A. Owen Ward (chairman of the Electricity Supply Committee) stated that premises in South Street, Manningtree, were to be purchased for £750 for a district office, showroom, &c., and the Committee was also to purchase land at Walton-on-Naze on which to erect a showroom and store.

For Sale

The Winchester Electricity Department has for sale two Ferranti transformers, two G. E. C. motor-alternator sets, and two d.c. starter-regulator panels.

Chesterfield Corporation Electricity Department has for disposal circuit-breakers and transformers.

(See our classified advertisements.)

Jackson's Cardiff Branch

The branch of the Jackson Electric Stove Co., Ltd., at 10, Park Place, Cardiff, has recently been extended to afford larger showroom, office, and storage accommodation. Our illustration shows the new showroom, in which is effectively displayed a complete range of the company's products, including domestic electric cookers, thermal storage water heaters, wash-boilers, fires, utility heaters, &c. Regular demonstration lectures are given in the showroom, which has seating accommodation for eighty persons. The fixtures are of mahogany. There are spacious stockrooms underneath, and ample room is provided for the receipt and dispatch of goods, packing, &c. Large storage accommodation is also provided.

Jackson's showroom at Cardiff

Trade Announcements

Messrs. Brown Bros., Ltd., have recently purchased the goodwill and assets of James Bridger, Ltd., Poplar Walk, Croydon. They are carrying on the business at this address till the end of November when it will be transferred to Cherry Orchard Road, Croydon. Premises adjoining East Croydon Station (Southern Railway) have been acquired where a fully representative stock will be maintained. Mr. Leslie C. Bridger will represent Brown Bros., whilst Mr. W. J. Bailey will assist in the management.

Messrs. H. H. Martyn & Co., of Cheltenham, have amalgamated with Messrs. Maple & Co., of London, and will in future undertake such architectural manufacture as has hitherto been carried out by Messrs. Maple & Co. Messrs. H. H. Martyn & Co. will continue under the same management as before, with Mr. David Longden as managing director.

Smith Service Stores, Ltd., 651, Christchurch Road, Boscombe, Hants, have commenced business as electrical wholesalers, under the management of Mr. H. L. Nathan, who asks for manufacturers' catalogues and lists.

Prices of Materials

Messrs. F. Smith & Co. report, November 15th: Copper (electrolytic) bars and sheet, no change. Ditto, ditto, wire rods, £43 10s., 10s. dec. Ditto, ditto, h.c. wire, 7d., $\frac{1}{8}$d. dec. Silicium bronze wire 8$\frac{1}{2}$d., $\frac{1}{8}$d. dec.

Messrs. Edward Till & Co. report, November 15th: No change in price of india-rubber, Para fine.

Messrs. James & Shakespeare report, November 15th: No change in the price of copper bars (best selected) sheet and rod. English pig lead, £13, 5s. dec.

Consolidation of the German Electrical Industry

A new general organisation has been formed in Germany under the title of the Reichsverband der Elektrotechnische Industries, with Herr Philipp Kessler, of the Bergmann Electricity Works Co., as president. The Union comprises all the undertakings which are engaged in the manufacture of electrical products, and it will watch over the common interests of the medium and small works (about 800 in number) and also of the large concerns. The special interests of the large concerns will be looked after by the concerns themselves, while those of the other works will be safeguarded by the Association of Special Electrotechnical Works (the V.E.S.).

In anticipation of the formation of the Reichsverband the

V.E.S. has succeeded in bringing about a more rigid combination of the existing syndicates in the electrical industry. Thus the members of the installation material association (the E.L.T.) have become constituents of the V.E.S. as well as the members of the association of makers of appliances for lighting purposes; and the co-operation has also been obtained of a number of special works which had hitherto held aloof from the V.E.S. The reorganisation of the entire electrical manufacturing industry is now being followed by the constitution of trade sections for individual products, as for instance machines, transformers, radio apparatus, measuring apparatus, switchboards, telephony and telegraphy, conductors and cables, and many other branches. The Reichsverband is also to undertake propaganda work for the extension of electrical requirements and co-operate with the unions of installation contractors. A fund of 10,000,000 marks is said to have already been rendered available for the purpose of assisting in the financing of installation contractors, who have hitherto lacked the means for developing this particular branch of the industry.

A Church Lighting Installation

The Judson College Chapel of the University of Rangoon has recently been illuminated by "Gecoray" church lighting reflectors equipped with 100-W "Osram" lamps. As will be seen from our illustration a uniform intensity of illumination is obtained, which is ample for all requirements. The scheme, which employs Pirelli-General cable and "Magnet" conduit, was evolved by the General Electric Co. (India), Ltd., to the requirements of the architect, Mr. A. G. Bray, of Rangoon.

G.E.C. lighting in Judson College Chapel, University of Rangoon

Works Visit

The members of the Bradford Textile Society paid a visit to the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd., on November 8th. The party consisted of about sixty members of the Society, who, in addition to examining equipment and apparatus specially used in textile work, made a short tour of the works, being particularly interested in the meter factory and in the welding shops. A demonstration was given in the company's high-voltage laboratory. At the conclusion of the visit tea was provided in one of the staff canteens.

The German Lamp Industry

Under the provisions of the new cartel law the German Minister for Economic Affairs has issued an ordinance, which applies from November 1st to March 31st, 1934, forbidding the establishment of new factories for the production of wire filament lamps working at a pressure of less than 30 V, and forbidding existing lamp works to extend the manufacture of such lamps. This step has been taken in order to protect the fifty small lamp factories in Thuringia. These makers have formed themselves into the Union of Low-Tension Lamp Manufacturers, and the Osram group is negotiating with them for the regulation of the sales business, and also incidentally on behalf of the International Glow Lamp Cartel (the Phoebus Cartel) for their inclusion in this cartel.

The Torquay Electrical Exhibition

The recent Torquay electrical exhibition attracted over 18,000 visitors to the Town Hall during its six days' duration. A feature of the exhibition was the Corporation Electricity Department's inquiry bureau, which was of modern design. This stand, which was designed and built by the undertaking's staff, under the guidance of Mr. G. J. Hollyer, the borough electrical engineer and manager, incorporated concealed lighting, illuminated display pedestals and a desk. On a separate stand the electricity undertaking exhibited hired apparatus, and on the stage of the hall made a very attractive display of appliances. In co-operation with the Jackson Electric Stove Co., Ltd., afternoon and evening cooking demonstrations were given daily, while lectures on "How Electricity Helps the Farmer" were arranged in conjunction with the General Electric Co., Ltd. In addition to nine local electrical contractors, the following manufacturers were represented: Bastian & Allen, Ltd.; Bulpitt & Sons, Ltd.; British National Electrics, Ltd.; General Electric Co., Ltd.; Kelvinator, Ltd.; L. G. Hawkins & Co., Ltd.; Santon, Ltd.; Union Cable Co., Ltd. The Torquay branch of the E.A.W. also had an information bureau.

A general view of the Torquay exhibition

Standard Road Traffic Signals

At the request of the Departmental Committee on Traffic Signs, which was appointed by the Minister of Transport in December, 1931, the British Standards Institution has issued a British Standard Specification for Road Traffic Control (Electric) Light Signals, No. 505-1933. This had to be rather detailed. It defines the terms used. *e.g.*, signal, signal head assembly, &c., and then such optical requirements as the distribution of light, the direction of the beam, the arrangement of the optical systems, the green arrow, the colorimetric properties, and the transmittance of the glass, the visor and the height of the signal. The next section covers the actual construction, material, dimensions, reflectors, lamps, and wiring.

The control requirements are dealt with in separate sections, and there is a miscellaneous section covering such items as elimination of surges in the co-ordinating circuit, radio interference, external finish, interconnecting cables, and the use of plant leased from the G.P.O. The last section deals with the tests necessary for compliance with the Specification. Copies of the Specification (No. 505-1933) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Cable Impregnating Compounds

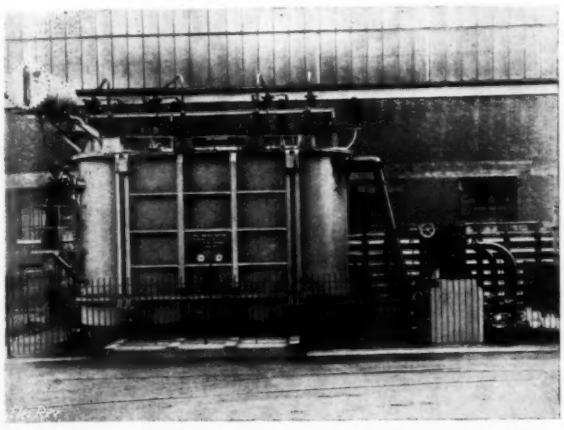
In a pamphlet on impregnating compounds for paper-insulated cables, Sternol, Ltd., states that the compound may constitute up to 50 per cent. of the total dielectric. The use of rosin with mineral oils has, with some exceptions, become almost a standard British practice, as its addition increases the viscosity so that the compound does not drain out when the cable is in service. A cable compound should be non-hygroscopic, dry, free from extraneous matter, and homogeneous, so that the rosin may not separate from the oil at any time. Chemical stability and freedom from mineral acidity or any chemical likely to react with other components of the cable is necessary.

Soluble oxidation products lower the insulating properties, and high resistance to oxidation from prolonged heat in contact with air is more easily obtained in a compound containing rosin than with a pure mineral oil. This effect increases with the amount of rosin used, but the limiting proportion is governed by other factors, such as the flexibility of the dielectric during cable laying. The higher the specific gravity of the oil the more stable is the mixture, and, broadly speaking, the higher the flash-point the better, as in oil-rosin mixtures this reflects the relatively low flash-point of rosin. The coefficient of expansion should be as low as possible in order to minimise the formation of voids in the dielectric, caused by expansion and contraction of the compound with temperature changes. The compound should act as a lubricant, enabling the layers of paper to slide easily when the cable is bent. It should be thin enough to give thorough saturation of the paper at the temperature of impregnation and yet thick enough to avoid drainage troubles in operation; it should have a low dielectric constant and high insulation resistance.

The insulation resistance will fall rapidly with rise of temperature, but it should be as high as possible over the whole temperature range. For super-voltage cables the a.c. conductivity of the compound is of the greatest importance to keep the power factor as low as possible at all temperatures. A good oil will not necessarily give a good compound with rosin, and artificial ageing of the oil compounds must be carried out to assess their stability with strict temperature control.

A Transformer Film

A record of the construction and transport of the two largest transformers in the world has been made in the form of a cinematograph film which is being shown this week in London. Each transformer is of 125,000 h.p. and weighs 120 tons without oil, bushings, or auxiliaries. They were transported by road and river from Walton-on-Thames to the Barking power



A 93,750-kVA Hackbridge transformer installed at Barking power station

station of the County of London Electric Supply Co., Ltd., for which they were designed and manufactured by the Hackbridge Electric Construction Co., Ltd., to the specification of Messrs. Merz & McLellan. Each is rated at 93,750 kVA and designed to step-up the full output of a three-phase, 50-cycle, 75,000-kW turbo-alternator operating at 0.8 power factor from 12,500 to 33,000 V.

New Catalogues and Lists

S. Wolf & Co., Ltd., 115, Southwark Street, S.E.1.—An illustrated and priced catalogue of "Wolf" electric tools.

Tube Products, Ltd., Oldbury, Birmingham.—An illustrated folder showing transformers in which the company's electrically welded tubing has been incorporated.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.—Print No. 450-46 describing a gauge type pressure switch with relay.

C. A. Parsons & Co., Ltd., Heaton Works, Newcastle-on-Tyne.—Pamphlets Nos. 48 and 49 relating to Parsons low-speed alternators and d.c. generators respectively.

F. C. Heayberd & Co., 10, Finsbury Street, E.C.2.—A folder containing illustrated particulars of model A.O.4 battery charger and charger kits 791, 792 and 793.

Holden & Brook, Ltd., Sirius Works, West Gorton, Manchester.—List No. 903, containing brief particulars of the "Dome" steam trap and No. 929 relating to "U-Tube" type calorifiers.

Fredk. Thomas & Co., Ltd., 189 and 191, Drummond Street, Hampstead Road, N.W.—A well-produced and comprehensive catalogue (127 pages) containing 277 designs of electric lighting fittings in both period and modern designs.

Fuller Accumulator Co. (1926), Ltd., Woodland Works, Chadwell Heath, Essex.—A display screen, printed in green, orange and black, relating to radio accumulators and h.t. batteries.

Belling & Co., Bridge Works, Southbury Road, Enfield.—A leaflet illustrating the third of the company's series of advertisements appearing in the daily Press drawing attention to Belling fires.

Foster Engineering Co., Ltd., Apex Works, Wimbledon, S.W.19.—A booklet based on a paper read before the Scottish Centre of the I.E.E., dealing with the design and construction of transformers. The booklet contains illustrations of transformers made by the company.

British Insulated Cables, Ltd., Prescot, Lancs.—Publication N.C.2.A containing tabulated particulars of B.I. paper-insulated cables for from 3,000- to 20,000-V working pressure.

M. K. Electric, Ltd., Wakefield Street, Edmonton, N.18.—An illustrated catalogue of M.K. electrical accessories. Reference to the various sections is facilitated by a thumb index.

Visco Engineering Co., Ltd., Stafford Road, Croydon.—Publication No. 333, illustrating and describing the Visco dust-collecting units, designed for collecting dust from light- and heavy-duty dry grinding machines.

Hart Accumulator Co., Ltd., Stratford, E.15.—A price list of Hart batteries for electric lighting installations. Also a card giving particulars and prices of "K B" type cells.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.—A pamphlet giving brief particulars of "Mercra" lamps for the lighting of highways, open spaces, &c., with some illustrations of installations recently carried out.

Siemens & General Electric Railway Signal Co., Ltd.—A brochure fully describing, with illustrations, searchlight signals for railways.

H. H. Martyn & Co., Ltd., Cheltenham.—A booklet containing some excellent illustrations of ships' interiors, for the decoration of which the company was responsible; also a booklet illustrating architectural metalwork for banks and offices, including lighting fittings in bronze.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.—Publication No. C.L.949, giving particulars of the "Escura" mercury gas discharge lamp for street lighting, floodlighting, &c., including illustrations of recent installations.

Runbaken Co., 280, Deansgate, Manchester.—A leaflet describing the "Aerial-X" aerial eliminator.

Johnson & Phillips, Ltd., Charlton, S.E.—A pamphlet containing illustrated particulars of the "Charlton" electric storage water heater.

Wallace Electrical Co., 9-9A, George Street, Manchester Square, W.1.—A well-produced and illustrated catalogue of a new form of decorative lighting, Wallace radial fittings.

Bankruptcy Proceedings

E. C. Lawrence and **G. E. Lawrence,** 508, Bristol Road, Bournbrook, Birmingham, lately trading as Lawrence Bros., Avia Works, Byron Street, and 207, Barkers Butts Lane, Radford, Coventry, electrical engineers.—The public examination herein was held recently at the County Hall, Coventry, when the joint statement of affairs showed a deficiency of £765. The separate estate of E. Lawrence showed a deficiency of £7 and that of G. Lawrence a deficiency of £80. It appeared that in September of last year debtors secured a contract for the delivery of 150 wireless receivers, but they were held up by a delay in the delivery of certain parts as a result of which the contract was cancelled and the debtors were left with a quantity of components on their hands.

G. Blades, 55, Hainton Avenue, and 52, Pasture Street, Great Grimsby, electrical engineer.—This debtor applied for his discharge on November 8th at the Town Hall, Great Grimsby, when it was reported that the receiving order was made in July, 1927, the liabilities amounting to £319 and the claims to £340. A first and final dividend of 9¾d. in the £ had been paid. Debtor had not kept a full set of books, but estimated that his turnover had been about £7 10s. per week, with no profits to meet drawings of £2. The application was refused.

R. McKay, 134, Bradford Road, Idle, Bradford, wholesale electrical dealer.—The first meeting of the creditors of the above took place on November 7th at the Official Receiver's office, 71, Manningham Lane, Bradford, when debtor said his failure was due to illness caused by a motor accident, and subsequent loss on business transactions. His statement of affairs showed a deficiency of £104. The matter was left with the Official Receiver as trustee.

W. R. C. Purves and **S. Bell** (Vulcan Radio Co.), 2, Murray Road, Workington.—First and final dividend of 3s. 5d. in the £, payable November 15th at 18, Bank Street, Carlisle.

A Sudds, electrical engineer, the Café, Apple Tree Corner, Gerrard's Cross.—First meeting, November 17th, at 8, Forbury, Reading. Public examination, December 1st, at the Town Hall, Windsor.

W. R. J. White, electrical agent, 29, Great Pulteney Street, London.—Further supplemental dividend of 2d. in the £, payable at Bankruptcy Buildings, Carey Street, W.C.

H. B. Hydes (Western Radio), radio engineer, 71, Allerton Road, Liverpool.—First and final dividend of 1s. 4½d. in the £, payable November 15th, at the offices of the Official Receiver, Government Buildings, Victoria Street, Liverpool.

Company Liquidations

Marlborough Radio Co., Ltd., Ashton Road, Oldham, Lancs.—The statutory meeting of the creditors herein was held recently at the company's offices, when the statement of affairs showed liabilities of £313 and net assets of £14, leaving a deficiency of £299. It was stated that the company was formed in September, 1932, with a nominal capital of £2,500, and an issued capital of £810. It was intended that it should make two models for the market, but shortly after the commencement of the manufacturing there was a big slump in radio sets with the result that it was unable to compete. A debenture for £300 was registered on June 30th, 1933. During the first year's trading the turnover amounted to £1,420, with purchases of £1,682, and a gross profit of £184, but there was a net loss incurred of £800. The expenses were largely made up of wages and commission £562, and advertising £211. The shareholders had already met and nominated Mr. H. Gartside, Clegg Street, Oldham, as liquidator, but the creditors decided that Mr. N. N. Rees, of Messrs. Platt & Whipp, Church Lane, Oldham, should be appointed liquidator of the company, with a committee of inspection. It was also decided to inquire into the question of the legality of the debentures.

Quickfix Electrical Fittings Co. (1928), Ltd.—Third dividend of 4d. in the £, payable on application to the joint liquidators, Messrs. W. J. M'Laughlin and A. Pyper, 193, St. Vincent Street, Glasgow.

Eastern Counties Electric Equipment, Ltd.—Particulars of claims by November 24th to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Boothroyd Repairs, Ltd.—Winding up voluntarily. Liquidator, Mr. I. Buck, 41, North John Street, Liverpool.

Dissolutions of Partnership

W. Martindale & Co., electrical engineers and contractors, 59 and 61, Fylde Road, Preston.—Messrs. W. Martindale and S. Porter have dissolved partnership. Mr. Martindale will attend to debts and carry on the business at 63 and 65, Fylde Road, Preston. Mr. Porter has commenced a business on his own account at "Electric House," Liverpool Road, Longton, near Preston.

The British Fan & Electric Co., ventilating and electrical engineers, 21, Mount Pleasant, Rosebery Avenue, E.C.—Messrs. R. T. Yeates and G. Hartigan have dissolved partnership. Mr. Yeates will attend to debts and carry on the business.

Nulite, electrical engineers, 44, Fenwick Street, Liverpool.—Messrs. L. G. Crees and P. N. Mayoh have dissolved partnership. Mr. Mayoh will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Australia.—EXTENSIONS TO PERTH POWER HOUSE.—The Government of West Australia proposes to spend £471,737 on extensions to the East Perth power station. Mr. W. H. Taylor, general manager of the Government Tramway and Electricity Department, states that the additions will include a 25,000-kW turbo-alternator and three new boilers for pulverised coal firing. Complete coal and ash handling equipment is also included in the specification. Negotiations are taking place with British manufacturers regarding financial arrangements prior to the placing of contracts.

Aylesbury.—ELECTRIC WASH-BOILERS INSTALLED.—The Town Council has decided to install electric wash-boilers in three Council houses for three months as an experiment, with a view to their use in other dwellings.

Birkenhead.—OBJECTION TO SPECIAL ORDER.—The Cheshire County Council has lodged an objection to the Birkenhead Corporation's application for a Special Order to extend its area of supply to include Neston and Wirral, parts of Bebington and Ellesmere Port, and part of the Chester rural district.

Burton-on-Trent.—REVISED TARIFF.—The Electricity Committee has recommended the Town Council to adopt a two-part tariff as an alternative to the present flat rates. The scale proposed provides for a minimum annual charge of £2 per annum for houses up to 1,000 sq. ft. floor space plus ¾d. per kWh for all electricity consumed.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains to Branston at an estimated cost of £1,200.

Colchester.—EXTENSIONS.—The Electricity Committee has obtained sanction to a loan of £33,500 for extensions, and recommends the laying of underground cables along the by-pass road from North Station Road to Harwich Road, at an estimated cost of £2,154.

Darlington.—OVERHEAD LINES.—The Rural District Council has approved plans submitted by the North Eastern Electric Supply Co., Ltd., for overhead lines at Heightington.

SUPPLY TO BRAFFERTON AND COATHAM MUNDVILLE.—The Rural District Council has agreed to ask the North Eastern Electric Supply Co., Ltd., to consider supplying electricity to Brafferton and Coatham Mundville. It was stated that the company had recently taken a canvass of the inhabitants of the area concerned but was not satisfied that there was a sufficient demand.

Dover.—EXTENSIONS.—Various mains extensions are to be undertaken at a cost of approximately £8,000.

Droxford.—OVERHEAD LINES.—The West Hampshire Electricity Co. is applying to the Ministry of Transport for consent to erect overhead lines in the area of the Rural District Council. The latter has requested the engineer of the company to discuss the sites for poles with the Highways Committee.

Fareham.—ATTEMPTS TO INCREASE LOAD.—After consultation with the Portsmouth Electricity Department regarding the two-part tariff, etc., and for the hire of cookers, etc., it has been decided to encourage the consumption of electricity in the town by means of hiring appliances and the introduction of a two-part tariff, and to apply to the Portsmouth Electricity Department for a reduction in the present charge for electricity.

France.—A LONG-SPAN TRANSMISSION LINE.—The Compagnie d'Electricité de Brest et Extensions has recently constructed a 15,000-V power transmission line between the 45,000/15,000-V sub-station at Rumengol and Crozon. The line crosses the River Aulne at Terenez (Finisterre) by a single span of 2,150 ft., and in order that this may be done without interfering with navigation two steel towers 89½ ft. in height have been erected, so that, taking into account the sag in the line and the banks on which the towers are erected, there is a clear headway for shipping of about 129 ft. The masts have been so designed that they can later carry a 45,000-V transmission line.

Hailsham.—SUPPLY EXTENSIONS.—The Rural District Council has approached the Weald Electricity Supply Co., Ltd., regarding a supply of electricity to Vines Cross, Heathfield. A request has also been made for mains extension between Magham Down and Gardner Street, Herstmonceux.

Hornby.—CANVASS.—The Lunesdale Rural District Council has been informed that a further canvass has been made at Hornby, and, as a result, a scheme for the provision of a supply of electricity will be submitted early in the year to the Lancaster Town Council by the Electricity Department.

Hull.—TUBULAR HEATERS.—The city architect is preparing bills of quantities for the new offices, and the Markets Committee has decided that an appropriate amount shall be included for the installation of electric tubular heaters.

Ibstone.—EXTENSION OF SUPPLY.—The Wessex Electricity Co. has prepared a scheme to provide a supply of electricity for Ibstone and other parishes in the district.

Ilford.—PROGRESS IN COOKING.—The borough electrical engineer reports that there is a great demand for electric cookers, and orders for 1,300 have been received during the last six months.

Isle of Man.—PROGRESS OF MANX SCHEME.—Good progress is being made in distributing electricity throughout the island. The towns of Ramsey, Castletown, Peel, Port Erin, and Port St. Mary are now receiving supplies, and the intervening villages will be brought within the scheme in due course. Electricity is being purchased in bulk from Douglas Corporation by the Isle of Man Electricity Board, which is administering the scheme, and, so far, the demand has been good.

Italy.—ELECTRICITY OUTPUT.—According to *L'Energia Elettrica*, the capacity of the power stations in Italy at the end of August last amounted to 4,510,000 kW, as compared with 4,456,000 kW at the corresponding date a year ago, an increase of 1.21 per cent. Hydro-electric plants were responsible for 3,712,000 kW and steam and internal-combustion-engined stations for 798,000 kW. The output of electricity in Italy during the eight months ending with August last is estimated at 7,107,755,000 kWh, as compared with 6,494,097,000 kWh for the corresponding period of 1932, an increase of 9.45 per cent. Of the total, hydro-electric stations are credited with 6,896,100,000 kWh and steam and internal-combustion-engined plants with 211,655,000 kWh.

Municipal Supply Undertakings' Results 1932-1933

District.	Engineer.	Total Revenue. 1931/32.	Total Revenue. 1932/33.	Working Expenditure. 1931/32.	Working Expenditure. 1932/33.	Net Profit or (*) Loss. 1931/32.	Net Profit or (*) Loss. 1932/33.	Sales of Electricity. 1931/32.	Sales of Electricity. 1932/33.
		£	£	£	£	£	£	kWh.	kWh.
Aberdeen	J. A. Bell	235,577	245,991	104,117	98,991	9,323	21,735	40,494,193	41,782,380
Ashford	H. Wilson	38,146	42,197	20,214	21 345	3,208	3,980	5,510,939	6,159,842
Ammanford	T. C. Davies	6,422	6,526	5 296	5,858	1,126	668	30,675	33,952
Belfast	F. H. Whysall	400,474	393,890	165,249	169,623	52,329	43,579	70,807,088	71,082,694
Berwick	E. B. Barlowe	5,273	5,353	—	—	91	101	191,349	266,546
Bexhill	C. A. Frost	45,070	47,771	33,715	33,939	439	2,128	5,158,738	5,602,873
Bingley	O. G. Cook	28,486	30,952	—	—	1,005	2,986	2,731,684	3,073,493
Birkenhead	F. E. Spencer	243,284	261,717	141,045	143,627	13,366	20,755	36,665,390	39,453,364
Bradford	T. Roles	623,856	611,581	359,569	373,447	29,694	24,712	99,671,585	111,731 772
Brighton	W. N. C. Clinch	360,112	364,760	172,689	177,035	47,271	36,813	71,940,694	92,334,833
Bristol	A. J. Newman	688,280	705,067	317,345	305,337	20,113	43,486	111,341,039	119,68[illegible]314
Burnley	J. E. Starkie	108,873	108,303	64,073	63,338	17,469	19,840	14,531,016	14,330,734
Bury	J. G. Potts	112,461	118,456	61,087	65,160	15,333	15,248	24,410,104	28,910,100
Cannock	P. Wardle	35,876	36,601	23,672	23,834	*618	282	5,944,758	5,662,805
Carlisle	C. W. Salt	114,062	115,830	50,263	53,367	6,887	4,786	22,758,992	25,020 158
Clacton	G. Broadhurst	—	41,411	15,282	16,770	4,485	816	—	2,857,970
Colne	J. H. Thompson	40,756	43,649	25,065	27,308	1,015	1,812	4,217,215	4,702,626
Crewe	H. H. Denton	39,328	40,072	22,675	25,502	4,485	5,346	—	—
Croydon	F. N. Rendell-Baker	388,811	434,027	157,958	187,285	57,900	36,011	69,521,605	105.388,505
Darlington	J. R. P. Lunn	—	84,191	—	45,087	5,339	7,321	25,876,000	26,432,000
Darwen	F. M. Fletcher	34,046	34,740	20,805	20,727	3,941	3,572	—	—
Derby	F. Nicholls	237 193	261,786	107,930	110,791	22,733	41,154	35,451,770	40 274,394
Douglas	B. Kelly	41,458	45,284	20,289	20,271	1,002	610	—	—
Eastbourne	J. K. Brydges	182,536	211,664	119 259	143,215	4,735	4,811	22,102,053	25,504,126
Eccles	H. W. Angus	51,709	54,833	33,973	36,680	7,524	7,477	8,193,405	8,945,540
Edinburgh	E. Seddon	719,890	769,499	473,677	486,125	2,603	39,249	145,325,706	182,118,975
Glasgow	H. Bell	1,257,784	1,277,130	626.887	568,617	45,813	134,983	236,815,327	234,641,424
Hackney	L. L. Robinson	319,569	334,303	149,455	157,885	23,445	20,254	45,882,284	52,058,503
Halifax	E. A. Mills	210,943	218,022	85,118	85,000	1,771	13,309	32,211,725	37,390,076
Harrogate	N. M'Lean	91,054	98,373	44,310	51,464	17,144	14,196	11,210,725	12 975,837
Hastings	A. J. Ryan	159,232	168,006	142,549	150,080	16,683	17,925	22,387,790	25,874,302
Heywood	H. C. Day	25,218	24,911	17,078	17,197	2,086	254	3,862,029	3,515,036
Hull	J. N. Waite	493,665	524,210	—	—	42,460	55,369	113,575,117	121,958,456
Ipswich	H. E. Blackiston	179,074	180,459	91,380	93,872	21,847	22,272	23,502,653	27,419,920
Islington	A. P. MacAlister	364,655	359,825	273,729	264,763	46,578	45,942	37,833,416	39,306,517
Kings Lynn	C. W. Jackson	38,254	43,607	18,401	20,638	4,347	5,972	4,691,128	5,599,548
Lancaster	G. C. Milnes	69,479	90,021	38,899	56,953	11,157	12,608	14,353,259	18,475,574
Leigh	J. B. Hudson	54,426	59,128	35,051	39,182	6,494	6,691	10,647,498	12,369,987

Sales of electricity in 1932'33 include in certain cases supplies given to the Central Electricity Board.

Kingston-on-Thames.—MAINS EXTENSIONS.—The Electricity Department is to lay mains for the Kingston Institution at a cost of £1,110.

Kirkcudbright.—SUPPLY TO TWYNHOLM.—The 11,000-V line between Kirkcudbright and Twynholm Village was switched on recently by Mrs. Maitland, Cumstoun, wife of Colonel Maitland, D.S.O., vice-convener of the Stewartry County Council.

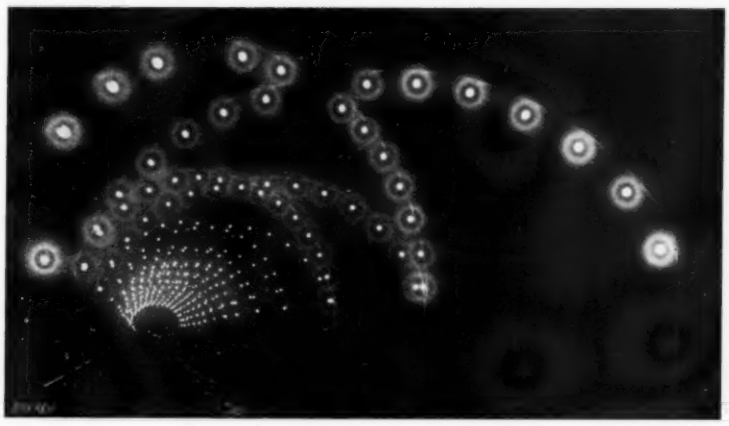
Leyton.—CHANGE-OVER.—The Town Council has applied for sanction to a loan of £38,100, the estimated cost of changing over the system of supply in the Leytonstone and Leyton areas.

Liddington.—SUPPLY INAUGURATED.—A supply of electricity has been provided for this parish by the Wessex Electricity Co., Ltd.

London.—STEPNEY.—The consulting engineer and manager of the electricity supply undertaking, Mr. W. C. P. Tapper, has sent us particulars of new tariffs which he has proposed. For the floor-area system it is suggested that the charge be based on 3 kWh per month at 4d. per kWh for each 100 sq. ft., or part thereof, up to 300 sq. ft., plus 1 kWh per month at 4d. per kWh for each additional 75 sq. ft., or part thereof, all additional consumption to be charged at ½d. per kWh. The engineer also recommends that, in order to bring the prepayment-meter consumers into line with the new rates adopted in September (4d. per kWh for lighting and ¾d. for power and cooking), the prepayment-meter rate shall be reduced from 6d. per kWh, with varying amounts of refund, to 4d. per kWh with no refund.

Malvern.—EXTENSIONS.—The Shropshire, Worcestershire & Staffs Electric Power Co. is to install overhead and underground h.p. lines and cables, in order to supply Barnards Green, Bellars Lane, and Wedderburn Road, in the parish of Guarlford. Mains are being extended in Upper Howsell (£250) and Gerladine Road (£240).

Margate.—REVISED CHARGES.—The following terms have been agreed upon by the Corporation with the Isle of Thanet Electricity Supply Co., Ltd., for the alternative two-part tariff, mentioned in our issue of October 6th: Domestic premises: A fixed annual charge, plus 1d. per kWh. Business premises, lighting, a fixed annual charge of £17 10s. per kW installed for the first 2½ kW and £15 for each additional kW. Heating £3 per kW. Power £5 per kW, with an additional "unit" charge of 1d.



A part of the illuminations carried out on the Eastbourne promenade by means of "Beeantee" strip lighting

Mevagissey.—INQUIRY.—An inquiry into the application of the Mevagissey Electric Supply Co., Ltd., for a Special Order authorising it to supply electricity to the parishes of Mevagissey, Gorran, Grampound, St. Ewe, Creed and Caerhays, was held recently by Mr. H. Nimmo, chief engineering inspector to the Electricity Commissioners. The application was opposed by the St. Austell Electric Light & Power Co., Ltd.

Northern Ireland.—BELFAST.—Subject to the approval of the Belfast Harbour Commissioners, the Electricity Committee is to proceed with a scheme for the transmission of electricity by overhead line from Musgrave Channel station to the County Antrim side of the city.

CARRICKFERGUS.—The Urban District Council is to apply for sanction to raise a loan of £18,000 for the electricity undertaking.

PORTRUSH.—The Government is to hold an inquiry concerning the Council's electricity undertaking. The inquiry is to consider the advisability of the Council closing down its generating station and taking an electricity supply from the Antrim Supply Co.

THE ELECTRICITY SUPPLY BILL.—The Northern Ireland Electricity (Supply) Bill has received the Royal Assent.

Pickering.—OVERHEAD LINE.—The Rural District Council has raised no objection to an overhead line being erected from Cartoft to Catterick by the North-Eastern Electricity Co.

Shipley.—NEW MAINS.—The U.D.C. Electricity Committee is to lay a new main in Carlton Grove at an estimated cost of £185.

South Africa.—EXTENSIONS AT PRETORIA.—The municipal electricity supply scheme at Pretoria is to be extended at a cost of about £350,000. Of this £75,000 is required for the extension of the mains and £275,000 for new plant, which will include a 20,000-kW turbo set and boilers. The additional plant is necessary owing to the needs of the South African Iron & Steel Industrial Corporation, which is reaching the production stage. At first the Corporation estimated its requirements at 3,000 kW per annum, but it has now informed the City Council that it will require 9,000 kW per annum. The City Council has applied to the Provincial Administrator for sanction to a loan of £350,000 to cover the expenditure.

PROPOSED PAARL SCHEME.—Paarl Electricity Committee has come to the conclusion that it can generate its own electricity much more cheaply than by taking supplies from the Electricity Supply Commission. The Town Council has therefore decided to ask the Provincial Administrator if objection would be raised to the Council's erecting a power plant on the basis of the report submitted three years ago by Mr. A. E. Val Davies, the consulting engineer of Capetown. Last year the consumption at Paarl was 3,000,000 kWh, and for the current year it is over 5,500,000 kWh.

Whitehaven.—OVERHEAD LINES.—The Ministry of Transport has consented to the erection by the Town Council of overhead distributing mains at the Woodhouse housing estate, and a loan of £500 for mains for this supply has been sanctioned.

Wick.—LOAN.—The Town Council is to borrow £2,000 for the development of the hired wiring system.

Wolverhampton.—ELECTRICITY PROGRESS.—The Electricity Committee reports that the sale of electricity continues to increase, the amount sold during the first six months of the present financial year representing an increase of 10 per cent. over the corresponding period of last year. The scheme for laying mains in every street in the borough, which was passed by the Council at its March meeting, is well in hand, and before the end of the current financial year a supply of electricity will be available to all prospective consumers in the borough.

Workington.—SUB-STATION AND SHOWROOM.—The Town Council has decided to negotiate for a site in Oxford Street for the erection of a sub-station and showroom in connection with the electricity undertaking at a cost of between £9,000 and £10,000.

BULK SUPPLY AGREEMENT ENDED.—The Workington Electric Power Co. has given notice to terminate the agreement for a supply of electricity in bulk after March 31st next, and negotiations are to be opened with the Central Electricity Board as to terms for a supply for the Corporation.

Worthing.—CHARGES FOR CINEMAS.—The Electricity Committee has agreed to offer the following terms for supply to the Odeon, Plaza and Royalty Cinemas:—Annual charge per kW of maximum demand £4 10s.; plus ½d. per kWh.

SUPPLY TO BAKERY.—The Electricity Committee has arranged to provide a supply of electricity at ½d. per kWh between the hours of 10 p.m. and 6 a.m. to Messrs. F. W. Mitchell for a 40 kW electric baker's oven.

Traction

Australia.—NEW SOUTH WALES TRAMWAYS SURPLUS.—For the first time for some years the tramway accounts of the New South Wales Government for the year ended June 30th, 1933, show a surplus. Mr. Stevens, the premier and treasurer, added that the result was an improvement of nearly £300,000, although reductions in fares had been made involving a loss of revenue of about £500,000 a year. The earnings for 1932-33 were £3,266,847, and working expenses were £2,780,871. There was a profit of £5,476.

TROLLEY-BUSES IN PERTH.—An experimental trolley omnibus service, which is the first of its kind in the Commonwealth, has been opened at Perth, West Australia. Mr. J. Scaddan, late Minister for Railways, who was responsible for the introduction of trolley-buses, predicted their development in the future, as the service could be extended for about £1,000 a mile, against £7,000 to £10,000 per mile for tramway extensions.

France.—PARIS "MÉTRO" EXTENSIONS.—Three of the fifteen suburban extensions of the Paris Métro lines now in course of construction will soon be completed and opened for traffic. The three extensions comprise, line No. 9 from the Porte de Saint-Cloud to the Pont de Sèvres; line No. 1 from the Porte de Vincennes to the Château de Vincennes; and line No. 12 from the Porte Versailles to the Mairie d'Issy-les-Moulineaux. The first will be opened at the end of January and the other two at the end of February or early in March next.—*Railway Gazette.*

Glasgow.—SUBWAY ELECTRIFICATION.—Work has begun on the scheme to electrify the Glasgow municipal haulage underground railway (the subway), which is to be completed next year. The entire scheme is estimated to cost £117,000. The haulage rope will disappear and a covered live rail will be in-

stalled, which will take a supply from Pinkston power station instead of from Scotland Street. The coaches will be reconditioned and nineteen new trains are required. They will each have four 60-h.p. motors and, with control gear on elaborate pneumatic principles, this part of the contract will involve £20,000. The extra motive power will permit a considerable speeding-up in the whole service, making it possible to run trains every 2¼ minutes. The new motors will give a maximum speed of 35 m.p.h., with an average for the circuit of 18 m.p.h., instead of the present 8½ m.p.h.

Holland.—DIESEL-ELECTRIC TRAINS.—The Dutch Railways have decided to adopt Diesel-electric vehicles on a number of lines, the ordinary electrification of which is under present conditions not considered justifiable and has recently placed orders for forty such motor coach trains intended for service between Rotterdam and Utrecht, between The Hague and Utrecht, between Amsterdam and Arnhem and between Utrecht and Eindhoven. The new trains will comprise three closely coupled coaches, the front and foremost of which will accommodate passengers, while the centre one is divided into three sections, one measuring 13 ft. 2 in. by 8 ft. 9 in. for the accommodation of the engines and dynamos, one for a luggage compartment, and one for passengers. Thirty-five of the trains will each be equipped with two 410-h.p. Maybach-Diesel engines coupled to generators, and four motors. Twelve of the electrical equipments will be delivered from the Baden and Munchenstein workshops of Brown, Boveri & Co., and the others will be built in Holland by the Heemaf N. V., Hengelo, to Brown-Boveri design. The coach trains are of streamline design and will accommodate a total of 160 sitting and 48 standing passengers.

Japan.—UNDERGROUND RAILWAY.—The first section of an underground railway in the city of Osaka has recently been opened to traffic states *Eastern Engineering & Commerce*. The tunnel, which is box-shaped and accommodates two rail tracks, measures approximately 16 ft. in height and 27 ft. in width; its depth below ground varies between 10 ft. and 28 ft. The line is operated on the third-rail system at 750 V d.c., the power being supplied from a sub-station at Umeda, where 22,000-V a.c. is converted by two sets of 2,000-kW rotary convertors.

Leeds.—TRACK RENEWAL.—The Tramways Committee is to construct a tramway in North Lane, Headingley, at a cost of £3,700.

Northampton.—TRACK RENEWAL.—The Corporation is to reconstruct the Kingsthorpe tramway track at an estimated cost of £20,390.

Traffic Signals.—The Lanark County Road Board has decided to proceed with the installation of Electromatic traffic control signals at an estimated cost of £660 at Newmains Cross. The Board has also decided to convert the fixed-time signals at Bellshill and Uddingston to "electromatic" operation at a cost of £375 and £320 respectively.

The Cheshire County Council has received the approval of the Ministry of Transport for the installation of vehicle-actuated signals at fourteen points in the county at an estimated cost of £6,000.

The Highways Committee of the Kent County Council recommends the installation of traffic signals at Beckenham (£506), Margate (£735), Chislehurst (£520), Whitstable (£433), Key Street (£521), Wateringbury (£484), Hawkhurst (£510), and Sheppey (£503).

Automatic traffic signals are to be erected at the junction of Upper Drive and Wilbury Villas, Hove.

In the London area traffic lights are to be installed at Hyde Park Corner, signals being erected at the junctions of Knightsbridge, Grosvenor Place, the entrance to Hyde Park and at the corner of Hamilton Place, Piccadilly.

Communications

Australia.—NEW BROADCASTING STATIONS.—Invitations for tenders for the erection of three new broadcasting stations have been invited by the Postmaster-General's Department. These stations will be more powerful than any yet erected in Australia. Provision will be made for an initial power in the aerial of 10 kW, with the possibility of the use of 60 kW if necessary. They will be located in the south-western district of Western Australia, western Victoria, and western New South Wales. Tenders for four others are under consideration. These will be situated in the Townsville area of Queensland, the Grafton area of New South Wales, the Sale area of Victoria, and the Launceston area of Tasmania. The first two will broadcast on a power of 7 kW, and the other two on a power of 2.5 kW.

AUTOMATIC TELEPHONY.—Within the next year, according to Mr. H. P. Brown, director of postal services, it is probable that tenders will be called for the erection of a new automatic telephone exchange in Melbourne. No definite plan has yet been adopted. The conversion of the central exchange to automatic switching has been suspended during the trade depression. The building and the necessary equipment would cost between £350,000 and £400,000, and the work would occupy about two years.

Belgium.—AERIAL TELEGRAPHY.—Passengers flying between London and Brussels are now able to telephone and telegraph by radio to almost any address. This facility has resulted from co-operation between the Belgian National Air Transport Co. and the Government, which operates all the wireless stations at Belgian aerodromes. Similar facilities are available to passengers in French, Dutch, and German aeroplanes.

Germany.—TELEPHONY WITH INDIA.—The Delhi and Simla extension of the telephone service between Germany and India, *via* London, has commenced operation. A three minutes' call costs 136 Marks (£10 5s. at present rates).—*Reuter* (Berlin).

Great Britain.—RADIO LICENCES.—The number of broadcast radio receiving licences issued during the month of October was about 829,000; the total in force at the end of the month was 5,768,000, a net increase of 47,500.

RADIO RELAY SERVICES.—The Watford Corporation has submitted a draft agreement to Watford Wireless Relays, Ltd.

The Bromley Rural Council has refused permission to Mr. A. P. Schove to establish a radio exchange in the district.

The Reigate Town Council has further deferred an application by Messrs. W. O. Rooper & J. Gibson. A Wireless Retailers' Association has been formed to protect the interests of local dealers, and to oppose the establishment of a relay system.

The Highways Committee of the Warwickshire County Council recommends that the Clerk of the Council be authorised to consent to the erection of overhead wires across country roads for radio relay services, subject to certain conditions and to the payment of a fee of £2 2s. for each inspection caused, and an annual payment of 2s. 6d. in respect of periodical inspections of each such wire or similar apparatus.

India.—VILLAGE RADIO SCHEME.—At the invitation of the Punjab Government, Lieut.-Col. H. R. Hardinge is to sail for India next month, says the *Morning Post*, to demonstrate the possibility of equipping villages in the province with broadcast radio receivers for communal use. The scheme is expected to be inaugurated experimentally next year. The type of receiver to be used will be set to one wavelength and locked, so that it cannot be interfered with. Switching on and off will be by means of a key, which will be in the care of the village schoolmaster or headman, in whose house the receiver will be installed. The loud speaker will be in the village schoolroom or meeting house, and power will be derived from a single car-type battery.

Lincoln.—TELEPHONES FOR POLICE.—The City Council is to modernise and speed up police intercommunication in the city by means of the erection in twenty-six selected positions of pillar telephones and signals. An agreement is to be entered into with the Postmaster-General for a term of ten years at a cost of £430 per annum. The present system by which patrol duty policemen use the ordinary telephone kiosks costs £425 per annum.

Manchukuo.—NEW RADIO STATIONS.—The Mukden Telegraphic Administration has commenced the establishment of radio stations at Tunhwa, Tungliao, Taonan, Yingkou, and Antung, and to provide long-distance communication between Mukden and Jehol is negotiating for the enlargement of the power plants at the existing stations at Mukden, Shanhaikwan, and Peipiao. The newly formed Manchuria Telegraph and Telephone Co. has commenced to establish a network of telegraph and telephone lines, and a total of 1,475 miles is due for completion by the end of 1934.—*Eastern Engineering & Commerce*.

South Africa.—DURBAN'S AUTOMATIC TELEPHONES.—It is now officially announced that the Postmaster-General's Department has ordered the automatic telephone installation for the Durban municipal system from the Automatic Electric Co., of Liverpool. The contract is for 11,000 lines.

NEW WIRELESS STATIONS.—The Government has decided to erect a wireless station at Kimberley for the benefit of aviation. A wireless direction-finding station, with a range of 400 miles, is also to be established near the Pietersburg aerodrome. This will complete the chain of wireless stations on the "All-Red" route between Capetown and Kisumu.

Spain.—AIR LINE WIRELESS ORGANISATION.—A wireless organisation is being prepared for the new air route between Spain and the Canary Islands, to be operated by the L.A.P.E. Company (Lineas Aereas Postales Espanolas). The aircraft will be fitted with Marconi dual-wavelength equipment capable of communication by telegraph and telephone on the wavebands of 40-80 metres and 500-1,000 metres. For the terminal airport in the Canary Islands a new ground wireless station is to be erected at Gando, Las Palmas, with a medium-wave Marconi 1½-kW transmitter. The short-wave transmitter will utilise an independent valve drive and will be suitable for 15 to 75 metres. The power to the aerial system, on continuous-wave telegraphy, is to be 100 W. The receiver will be a stable and selective instrument for the reception of telegraph and telephone signals between 10 and 200 metres. For direction finding, a Bellini-Tosi combined tuner and amplifier with a wave-range of 350 to 4,000 metres will be employed.

Turkey.—CABLE TELEGRAPHY ABANDONED.—The Eastern Telegraph Co., which has worked in Turkey for about thirty years, has closed down its offices there. They have been taken over by the Turkish Government and in future no cable messages will be sent to Turkey. All messages will go by radio and a special new station has been erected by the Government outside Istanbul to receive these messages.—*Reuter* (Istanbul).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Ardrossan.—November 22nd. Town Council. Various works, including electric lighting, at new fire brigade station and ten firemen's houses. Schedules (10s. 6d.) from and offers to Joint Town Clerks, Burgh Chambers, Ardrossan.

Argentina.—BUENOS AIRES.—December 4th. State Oilfields. Portable arc-welding equipment and grinding machine. (A.Y. 12076.)* Rotary air compressor. (G.Y. 13146.)*
November 27th. 600-V cable and house-wiring material. (A.Y. 12059.)*

Australia.—MELBOURNE.—Post and Telegraph Department. November 28th. Lead-sheathed switchboard cables. (A.Y. 12002.)*
December 5th. Microphones. (A.Y. 12030.)* Telephone switchboard cable. (A.Y. 12015.)*
December 12th. Telephone parts and accessories. (A.Y. 12032.)* Telephone indicators. (A.Y. 12033.)* Multiple twin telephone cables. (A.Y. 12016.)*
December 19th. Telephone dial parts. (A.Y. 12031.)* Vitreous resistances. (A.Y. 12042.)*
January 2nd. Telephone switchboard lamps and sockets. (A.Y. 12053.)* Telephone jacks and number plate. (A.Y. 12066.)*
January 9th. Hand-operated telephone generators. A.Y. 12064.)* Bells and buzzers. (A.Y. 12065.)*
State Electricity Commission of Victoria. December 4th. 22,000-V switchgear and accessories comprising oil circuit-breaker equipments with current transformers. (A.Y. 12014.)*
January 8th. Five automatic induction voltage regulators. (A.Y. 12071.)* 115-kW a.c. motor. (A.Y. 12053.)*
January 15th. Triple braided copper conductor. (A.Y. 12054.)*
BRISBANE.—January 31st. City Electric Light Co., Ltd. Land and submarine cable. (A.Y. 12072.)*

Edinburgh.—December 1st. Corporation. Installation of two electrically operated goods lifts at the electricity supply station, Dewar Place. Specifications from city architect, City Chambers. Tenders to Town Clerk.

Egypt.—CAIRO.—Ministry of the Interior. November 30th. Six 50-kVA transformers. (A.Y 12013.)*

Fife.—November 25th. County Council. Various works, including electric lighting, at Cardenden housing scheme (thirty houses). Schedules from W. Williamson & Hubbard, chartered architects, Kirkcaldy. Tenders to Mr. J. M. Mitchell, county clerk, County Buildings, Cupar.

Glasgow.—November 20th. Corporation Gas Department. Small automatic passenger hoist, travelling electric conveyors, &c. Specifications and forms of tender from general manager, Gas Department, 20, John Street. Tenders to Town Clerk.

Hastings.—December 2nd. Electricity Department. Supply of transformers for the year 1934. (November 10th.)

India.—NEW DELHI.—December 4th. Indian Stores Department. 200/230-V, single-phase, 50-cycle ceiling fans. (A.Y. 11959.)*
November 28th. Cotton- and silk-covered wire. (A.Y. 12044.)*
December 11th. D.c. ceiling fans. (A.Y. 11965.)*
January 8th. A.c. and d.c. table fans. (A.Y. 11967.)*

London.—ISLINGTON.—November 17th. Electricity and Lighting Committee. Supply of materials and labour in connection with the laying of distributor cables and earthenware pipes. (October 27th.)
ST. PANCRAS.—December 7th. Borough Council. Vehicle-actuated traffic signals. (See this issue.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. December 5th. 2,400 lb. of cored solder. (G.Y. 13046.)*
January 8th. Microtelephone cradles. (A.Y. 12046.)* Telephone jacks. (A.Y. 12045.)*
January 9th. A 100-Ah secondary battery with 60 cells. (A.Y. 12047.)*
January 16th. Public Works Department. Four 1,500-kVA transformers. (A.Y. 12017.)*

Northern Ireland.—BELFAST.—November 22nd. Police Committee. Electrically illuminated traffic signs. (November 3rd.)

Rhyl.—November 28th. Urban District Council. Cable for twelve months. (See this issue.)

South Africa.—KROONSTAD.—December 4th. Municipal Council. Machinery and plant for a power station. A.Y. 12004.)* Steam raising plant. (G.Y. 13038.)* Motors, meters, cable, transformers, conductors, kiosks and other electrical items. (A.Y. 12029.)*

CAPETOWN.—November 29th. Electricity Department. Fifty automatic street-lighting controllers. (A.Y. 11994.)* 7,000 iron-clad service cut-outs. (A.Y. 12051.)*
November 30th. H.p., l.p. and telephone cables. (A.Y. 12052.)*

Swansea.—December 4th. Corporation. Steam and feed water piping, valves, &c., for Tir John power station. (November 3rd.)

Uruguay.—MONTEVIDEO.—November 30th. State Electricity Supply and Telephones Administration. 101,400 metres of lead-covered conductors. (A.Y. 12012.)
November 29th. 233,000 metres of insulated conductors for outdoor use. (A.Y. 12011.)*

Warmley.—November 24th. Rural District Council. Materials and labour in connection with an extension of the Council's electricity mains. (November 10th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aldershot.—Town Council. Accepted. Distributing cable (£937).—Callender's Cable & Construction Co., Ltd. Three transformer kiosks (£480).—General Electric Co., Ltd.

Blyth.—Education Committee. Recommended. Electric lighting at Princess Louise Road infants' school (£120).—Blyth Plumbing and Electric Co.

Colchester.—Education Committee. Accepted. Electrical installation at Harwich Road School (£111).—H. E. Gosnell.

Ilford.—Electricity Committee. Recommended. Battery (£220).—Fuller Accumulator Co., Ltd.

Leeds.—Watch Committee. Accepted. Traffic signals (£972). —Automatic Electric Co., Ltd.

London.—L.C.C.—Central Public Health Committee. Accepted. Rewiring for electric fire-alarm system, Grove Hospital, Tooting (£538).—L. G. Tate & Co., Ltd. Hackney Hospital and Institution.—Wiring and fittings for electric lighting in block for female infirm patients and male nurses' quarters (£864).—A. V. Gifkins & Co., Ltd. Wiring and fittings for electric lighting in pavilion D (£675).—Samuel Reed & Sons. Lambeth Hospital. Wiring and fittings for lighting and power in the central laundry (£422).—Read & Partners, Ltd. Electrical work in "X" block and new servery (£406).—Anderson Angell & Co. Electric bed and goods lifts, Lewisham Hospital (£790).—Evans Lifts, Ltd. Fire-alarm system, Mile End Hospital (£493).—L. G. Tate & Co., Ltd. Wiring and fittings for lighting of administrative block, Northern Hospital (£434). —H. J. Cash & Co., Ltd. Wiring and fittings for electric lighting, power, telephones, &c., in various departments, Paddington Hospital (£351).—Harland & Wolff, Ltd. Wiring and fittings for lighting, power, telephones, &c., St. Giles Hospital, Camberwell (£735).—Buchanan & Curwen, Ltd. St. Mary Abbots Hospital. Electric bed lift (£620).—Evans Lifts, Ltd. Wiring and fittings for lighting, power, &c., in block C (£736). —T. Clarke & Co. Wiring and fittings for lighting, &c., in the pathological laboratory (£326).—Francis Polden & Co., Ltd. Wiring and fittings for lighting, &c., in various departments, St. Mary, Islington Hospital (£643).—H. J. Cash & Co., Ltd. Wiring and fittings for electric lighting, St. Pancras Hospital (£598).—L. G. Tate & Co., Ltd. Electric bed lift, St. Peter's Hospital, Whitechapel (£630).—Evans Lifts, Ltd.

Manchester.—Transport Committee. Accepted. Portable electric vacuum cleaners for bus garages.—D. Foxwell & Son: Equipment and Engineering Co., Ltd.; Sturtevant Engineering Co., Ltd.

Portsmouth.—Education Committee. Accepted. Electric heating and lighting at Cottage Grove School (£1,713).—Shields & Marshall.

Uttoxeter.—Urban District Council. Accepted. Electric wiring in 128 new Council houses (£502).—C. A. Newton & Co.

Winchester.—City Council. Accepted. Three 300-kVA oil-cooled transformers.—English Electric Co., Ltd. Three kiosk sub-stations and h.p. switchgear.—Ferguson, Pailin, Ltd.

Forthcoming Events

Institution of Mechanical Engineers.—Friday, November 17th. Institution, London. 6 p.m. "Heat Liberation and Transmission in Large Steam Generating Plants." Messrs. E. W. Robey and W. F. Harlow.

Overhead Lines Association.—Friday, November 17th. Harrods, Ltd., Knightsbridge. 8 p.m. Conversazione and supper-dance.

Physical Society.—Friday, November 17th. Imperial College of Science and Technology, S.W. 5 p.m. Presidential address. "The Measurement of Magnetic Field Distortion." Prof. A. O. Rankine.

Junior Institution of Engineers.—Friday, November 17th. Institution, London. 7.30 p.m. "Recording Sound for Motion Pictures." Mr. W. Harris.

Electrical Power Engineers' Association (*London Technical Group*).—Tuesday, November 21st. Caxton Hall, Westminster, S.W. 7.15 p.m. "Refractories." Mr. D. Dixon. (*Manchester Section*).—Saturday, November 25th. Grand Hotel, Manchester. 5.30 for 6 p.m. Annual dinner and dance.

Association of Supervising Electrical Engineers.—Tuesday, November 21st. Lighting Service Bureau, W.C. 7.15 p.m. "Electric Heating of Buildings." Mr. E. MacA. Young.

British Electrical Development Association.—Wednesday, November 22nd. Caxton Hall, S.W. 7.30 p.m. "The Art of Public Speaking." Mr. Elliott Stone.

British Science Guild.—Thursday, November 23rd. Goldsmiths' Hall, Foster Lane, E.C. 4.30 p.m. "Empire Communication." Prof. E. V. Appleton.

Electrical Industries Benevolent Institution.—Thursday, November 23rd. Grosvenor House, Park Lane. Electrical Industries' Ball.

Institution of Electrical Engineers.—Thursday, November 23rd. Institution, London. 6 p.m. "Recent Investigations on Telephone Interference." (E.R.A. Report.) Messrs. W. G. Radley and S. Whitehead. (*London Students' Section*).—Saturday, November 18th. 6 p.m. Visit to the *Daily Express* building, Fleet Street, E.C. Saturday, November 25th. 2.20 p.m. Visit to the London Electric Railway main sub-station, Wood Green. (*North Midland Students' Section*).—Saturday, November 18th. 2.15 p.m. Visit to works of Messrs. P. Garnett & Sons, Ltd., Otley. (*Mersey and North Wales (Liverpool) Centre*).—Monday, November 20th. The University, Liverpool. 7 p.m. "The Application of Automatic Voltage and Switch

Control to Electrical Distribution Systems." Messrs. W. Kidd and J. L. Carr. (*Western Centre*).—Monday, November 20th. Town Hall, Cheltenham. 6 p.m. Discussion on "Gale and Storm Damage." Opened by Mr. W. D. Tuck. (*South Midland Centre*).—Monday, November 20th. James Watt Memorial Institute, Birmingham. 7 p.m. Mr. Marshall's paper. Friday, November 24th. Grand Hotel, Birmingham. 6.30 for 7 p.m. Annual dinner. (*North Midland Centre*).—Tuesday, November 21st. Hotel Metropole, Leeds. 7 p.m. Mr. Marshall's paper. (*North-Western Centre*).—Tuesday, November 21st. Engineers' Club, Manchester. 7 p.m. "Recent Investigations on Telephone Interference." Messrs. W. G. Radley and S. Whitehead. (*South Midland Students' Section*).—Tuesday, November 21st. James Watt Memorial Institute, Birmingham. 7 p.m. "An Electric Totalisator." Mr. E. Plumley. Thursday, November 23rd. 7.30 p.m. Visit to Perry Barr Stadium. (*Wireless Section*).—Wednesday, November 22nd. Institution, London. 6 p.m. Discussion on "The Interference of Electrical Plant with the Reception of Radio Broadcasting." Introductory remarks by Mr. A. Morris. (*West Wales (Swansea) Sub-Centre*).—Friday, November 24th. Electric House, Swansea. 6 p.m. "Notes on the Jointing of E.h.p. Underground Cables." Mr. G. O. James. (*North-Eastern Students' Section*).—Friday, November 24th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Precision Alternating Current Measurements." Mr. M. Waters.

Edinburgh Electrical Society.—Saturday, November 25th. Visit to Craigpark Cable Co., Glasgow.

Association of Mining Electrical Engineers.—Saturday, November 25th. Visit to the Cardiff Engineering Exhibition.

Notes

Electric Discharge Lamps at Lewisham

In our leading columns of November 3rd we commented on the reference back by Lewisham Borough Council of a report of the Works Committee which recommended the lighting of seven miles of streets in West Lewisham by the new "Osira" lamps. The Works Committee stood by its recommendation and the Council at its meeting on November 8th decided by a majority of nineteen votes in favour of the electricity scheme, with a reduction in the number of years from fifteen to five.

The significance of this contract is that gas interests are exceedingly strong in Lewisham. The Gas Co. had installed its latest developments in street lighting to compete with the trial discharge lamps and put up a well-organised opposition to the proposals to change over to electricity, in view of its being a widely watched and clear-cut contest between the rival methods of illumination.

The electric discharge lamps are of the high-pressure mercury-vapour type, the technical features of which were explained by Mr. J. W. Ryde, of the G.E.C. Research Laboratories, in our issue of October 27th. They are an improved type of the "Osira" lamps in use on the Watford Road, Wembley, and on the Manchester-Stockport road. The 224 lamps are spaced 168 ft. apart and are mounted 22 ft. above the road surface. This success of the South Metropolitan Electric Light & Power Co. follows that of its associated concern, the County of London Electric Supply Co., in securing the lighting of ten miles of streets in Finsbury on the grounds of greater road safety, fog penetration, and equal and diffused light without shadow as well as of lower cost than gas.

The Generation of Electricity

The official returns rendered to the Electricity Commissioners show that 1,246,000,000 kWh was generated by authorised undertakers in Great Britain during October, 1933, as compared with the revised figure of 1,101,000,000 kWh in the corresponding month of 1932, representing an increase of 145,000,000 units, or 13.2 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-six, the same as last year.

During the first ten months of 1933 up to the end of October, the total amount of electricity generated by authorised undertakers was 10,598,000,000 kWh, as compared with the revised figure of 9,742,000,000 kWh for the corresponding period of 1932, representing an increase of 856,000,000 kWh, or 8.8 per cent.

The following table gives the figures for each of the first ten months of the current year and 1932:—

	1932. kWh (millions).	1933. kWh (millions).	Inc. or dec. per cent.
January	1,162	1,336	+15
February	1,133	1,151	+ 1.6
March	1,091	1,160	+ 6.3
April	987	952	− 3.5*
May	895	1,004	+12.2
June	823	885	+ 7.5
July	807	913	+13.1
August	815	928	+14
September	923	1,023	+10.8
October	1,101	1,246	+13.2
Total for ten months ...	9,742†	10,598	+ 8.8

* Due to Easter holiday and the fact that Summer Time commenced eight days earlier than last year. † Revised total.

Dublin University Engineers

At the fifth annual dinner of the Association of University Electrical Engineers, held in Dublin on November 11th, the Minister for Industry and Commerce disclosed the intention of the Executive Council to set up an organisation for industrial research. Mr. Lemass, the Minister, in proposing the toast of "The Association," said that the genius of the engineer was responsible for the machines which displaced labour and glutted the markets of the world with their products, so it was only logical that one should look to the same genius to devise a rational and humanitarian way out. Therefore the Irish Free State Government was going to make an effort to co-ordinate the efforts of all Associations engaged in the investigation of scientific problems, in order that the material resources of the country should be discovered, set free, and used to the greatest advantage of the people. He hoped soon to bring in a Bill to set up an industrial research organisation, and he asked young engineers for their ardent co-operation.

Legislation for Distribution

On Wednesday afternoon Sir Philip Dawson, M.P., was to ask the Minister of Transport whether he considered legislation should be introduced to deal with the distribution of electricity. The reply of the Minister was not available at the time of going to press.

Smoke Detection on Ships

The automatic audible alarm and visual fire-detecting system which is installed in the new M.V. *Malaita* was manufactured by Automatic Light Control, Ltd. Air ducts or pipes, incorporating motor-driven suction fans, connect the various holds and compartments to a smoke-detection chamber, in which are a light-sensitive bridge, a light source, and selector mechanism. Thence the pipes go to an indicating cabinet in the wheel-house, where automatic audible alarm and visual detecting devices are situated. A suction trunk is provided between the indicating cabinet and the motor-driven fans, the discharge for which is led back to the wheel-house, where it is controlled by a two-way valve in order that smoke may be either discharged into the atmosphere or into the wheel-house, thus enabling the officer on watch to detect a fire by sense of smell. In the event of an outbreak of fire, the suction fan, which is continuously drawing samples of air from all holds, causes the smoke to pass into the particular test chamber associated with the hold affected. The smoke thus introduced causes light from an exciter lamp to impinge on a light-sensitive bridge by means of an automatic scanning mechanism which is continuously viewing each test chamber in turn. Relay mechanism is operated, and an audible alarm given in the wheel-house. At the same time, by means of the electrical selector gear, an indicator lamp is illuminated.

Single-phase or Three-phase Meters?

The arguments recently advanced by F. Raynaud for the use of three single-phase meters in preference to a three-phase instrument (see ELECTRICAL REVIEW, August 18th, page 222) are opposed by V. Brunier in a later issue of *Revue Générale de l'Électricité*. According to this author, the defects of early types of three and four-wire, three-phase meters have been overcome. In particular, the accuracy attainable is now equal to that of single-phase meters, mutual interference between the driving elements has been eliminated, and three-phase meters are available which can be connected in either phase-sequence without affecting their accuracy.

From the service standpoint, the size and cost of the meter board, the number of transformers (in h.p. systems), and the complexity of connections are greater for three single-phase meters than for one three-phase meter. Finally, the reading of three meters instead of one (or six instead of two, where duplicate metering is provided) offers increased opportunity for mistakes; and the use of three single-phase meters instead of a polyphase instrument is contrary to the general policy of simplification and labour saving.

I.E.E. London Students

The London Students' Section of the Institution of Electrical Engineers, held a smoking concert at Carr's Restaurant, on November 9th. Well over one hundred members of the section attended, and among the guests were Mr. P. V. Hunter, president of the Institution, Messrs. H. T. Young and J. H. Reyner, and student and graduate representatives of the Institutions of Civil and Mechanical Engineers. An enjoyable programme was arranged by Mr. Martin, the Section's entertainment secretary, which included some excellent items of amateur and professional talent.

North Wales Engineers' Dinner

The annual dinner of the North Wales Electrical and Communication Engineers will be held at the Castle Hotel, Bangor, on Saturday, December 2nd. Mr. Price F. White, borough electrical engineer, Bangor, will preside. Tickets can be obtained from Mr. J. H. Watkins, "Elsinore," Upper Garth Road, Bangor, Caernarvonshire.

Appointments Vacant

Cookery demonstrator and showroom assistant for Stepney Electricity Department.

Assistant mains engineer and lady demonstrator for Eastbourne Electricity Department.

Showroom assistant for Barrow-in-Furness Electricity Department.

Distribution engineer for an electricity undertaking in the Punjab, India.

(See our classified advertisements.)

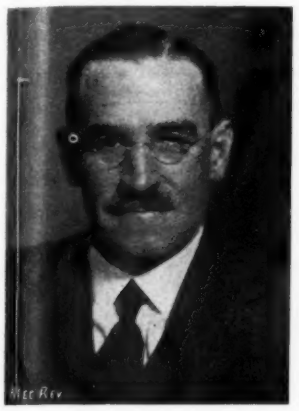
Makers' Names Wanted

EROS thermal flasher.
SERRARRE OR SERRANE fire.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir William Ray, M.P., will propose the principal toast at the annual dinner of the South Midland Centre of the Institution of Electrical Engineers, to be held on Friday next, in place of the Master of Sempill, who will be unable to attend on account of his recent motoring mishap in Chicago.



Elliott & Fry
Mr. E. W. Short

Mr. Ernest W. Short, A.M.I.E.E., the author of the article on "Inefficient Driving by D.C. Motors," which appears on page 691, was educated at Foster's School, Sherborne, and Finsbury Technical College. Upon leaving the college, he joined the British Electric Plant Co., Alloa, as assistant to the designer, and he subsequently specialised in the sale and technical application of electric power in industry. He was for three years sales engineer to the Yorkshire Electric Power Co., five years engineer in the technical department of the Igranic Electric Co., and after the war he joined Electric Control, Ltd., Glasgow, as sales manager. In 1927 he returned to the Igranic Electric Co., Bedford, for technical and sales duties in connection with the manufacture of motor control gear. During the war period he held honorary commissioned rank in the Royal Air Force for duty in the inspection department of the Air Ministry, in course of which he had charge of inspection at some of the large factories building service and civil machines.

Mr. W. Wyld, M.I.Mech.E., M.I.E.E., has been appointed by Messrs. George E. Gray, Ltd., timber importers and manufacturers of Ilford, to handle their electrical department for the supply of meter-boards, wooden blocks, etc., used in the electrical trade.

Mr. Ernest King, Wh. Ex., M.I.Mech.E., has been elected chairman of the Junior Institution of Engineers for the current year, and Messrs. H. P. Wright and A. E. Bingham, A.M.I.Mech.E., are vice-chairmen.

Miss J. R. Appelbee, of Ashton-under-Lyne, has been appointed lady demonstrator at the new electricity showrooms of the Peterborough City Council at a salary of £125 per annum, rising to £150, and **Mr. L. B. Cresswell** has been appointed assistant-in-charge of the showrooms, at a salary of £200 per annum.

The Editors of the ELECTRICAL REVIEW offer their cordial congratulations to **Mr. W. O. Smith,** chairman of Messrs. Elliott Bros. (London), Ltd., of Lewisham, who on November 10th celebrated his sixtieth year of association with this well-known firm of instrument makers. Mr. Smith joined Elliott Bros. in 1873, and his record of sixty years' continuous service with the firm forms a most exceptional achievement. Mr. Smith has always taken a very active part in the general management of affairs, and his energy, enterprise, and outstanding ability have been largely responsible for the fact that the extent of the firm's activities has continued to increase, until to-day it ranks as one of the largest and leading concerns specialising in the manufacture of electrical and mechanical instruments of all kinds. He has also taken a keen personal interest in all sports and social events connected with the firm. For three years he was chairman of the British Electrical and Allied Manufacturers' Association, and his length of experience and reputation rank him amongst the most prominent personalities in the electrical industry. Mr. Smith has been for many years the chairman of the governors of Faraday House Electrical Engineering College, and he is also a director of Elliott Bros.' associated company, Siemens Bros. & Co., Ltd., Woolwich, and their subsidiary companies. To mark the occasion, a presentation was made to Mr. Smith in the form of a large framed photograph of a group of directors and staff together with an autographed album.

Mr. W. O. Smith

Mr. M. J. Railing, joint managing director of the General Electric Co., Ltd., has been appointed vice-chairman in succession to **Mr. E. G. Byng,** who has resigned from that position for reasons of health. Mr. Byng will remain on the board. Mr. Railing has been associated with the G.E.C. for more than forty years. He was appointed joint managing director of the company with Sir Hugo Hirst in 1929, and since 1911 has occupied the position of general manager.

[Lafayette
Mr. D. Sinclair

Mr. Donald Sinclair, A.M.I.E.E., has relinquished his position as sales manager with Britannia Batteries, Ltd., on the expiration of his agreement, and he asks that for the present personal letters shall be addressed to him at St. Andrew's Club, 2, Whitehall Court, S.W.1. Mr. Sinclair has spent about forty-two years in connection with the electrical industry; for thirteen years he was with the General Electric Co., Ltd., and for twelve years with the Chloride Electrical Storage Co., Ltd., both in Scotland, followed by three years with Britannia Batteries, Ltd. He was also for three years in charge of the Falls of Foyer electricity plant of the British Aluminium Co., Ltd., and later on the electrical staff of Messrs. John Brown & Co., of Clydebank.

Obituary

Mr. W. McVittie, founder of the Wahnapitae Power Co., near Sudbury, Ontario, died at his home in Sudbury, on October 16th, at the age of eighty. A pioneer prospector of the northern mining country, he commenced his power development scheme in 1904, and sold out his interest in the company to the Ontario Hydro-Electric Power Commission in 1929.

Mr. W. H. Bendy.—The death occurred on November 6th of Mr. W. H. Bendy, at the age of fifty-three years, district engineer of the English Electric Co., Ltd., for the South Wales and South West England territory. He joined Siemens Brothers of Woolwich in 1901 and was later transferred to the Siemens Brothers Dynamo Works at Stafford. In 1909 he was appointed their district engineer for the Cardiff and South Wales area, continuing in this position when, in 1919, Siemens Brothers Dynamo Works was incorporated in the English Electric Co.

Mr. H. A. Vernet.—The death occurred on November 11th, at his home in South Kensington, of Mr. Henry Augustus Vernet, in his sixty-ninth year. Mr. Vernet, who was well known as chairman or director of a number of electrical concerns, commenced his career with his father's firm, Morris, Prevost & Co. He next joined the firm of Robert Benson, later becoming a partner. Until the formation of the London Passenger Transport Board he was deputy chairman of the Underground Electric Railways Co., of London, and he succeeded Lord Ashfield as chairman of the Associated Equipment Co. He was chairman of the British Power and Light Corporation, deputy chairman of the Metropolitan District Railway Co., and the London United Tramways, Ltd., and was also on the boards of a number of other companies. The interment took place on Tuesday last at Upper Church, Rickinghall, Suffolk, after cremation at Golders Green.

Elliott & Fry
The late Mr. H. A. Vernet

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Edgware and Stanmore Electrical Co., Ltd.—Private company. Registered November 6th. Capital, £1,000 in 1s. shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in all kinds of electrical appliances, wireless, television, gramophones, &c. The permanent directors are: G. H. Chayrou, 128, Whitchurch Parade, Edgware; and E. H. Dine, 6, Whitchurch Parade, Edgware. Registered office: 6, Whitchurch Parade, Edgware.

Hocking & Orchard, Ltd.—Private company. Registered November 6th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in dynamos, motors, magnetos, batteries, transformers and electrical plant generally, &c. The first directors are: E. L. Hocking, Ashley Lodge, Prior Park Road, Bath; and R. H. Orchard, De Montalt, Lyncombe Hill, Bath. Registered office: 90, Victoria Street, Bristol.

Walkers Wireless, Ltd.—Private company. Registered November 3. Capital, £350 in £25 shares. Objects: To acquire the wireless business of Walker & Son, and to carry on the business of wireless dealers and electricians, &c. The directors are: C. H. Walker, 1 and 2, Marine Terrace, Margate; and L. H. Walker, "Two Bridges," Connaught Road, Margate (partners of Walker & Son). Registered office: 1 and 2, Marine Terrace, Margate.

Elvants, Ltd.—Private company. Registered November 7th. Capital, £500 in £1 shares. Objects: To carry on the business of factors, commission agents, and dealers in electrical goods, in particular electric lamps, valves and signs, radio, &c. The subscribers are: E. A. Froud, 35, Craven Street, W.C.2; and Violet E. Ponton, 15, Evangelist Road, N.W.5. Secretary: Kenneth Barson. Registered office: 35, Craven Street, Charing Cross, W.C.2.

Christy Brothers (Wireless Relays), Ltd.—Private company. Registered November 8th. Capital, £5,000 in £1 shares. Objects: To establish and maintain broadcasting and other stations, and to carry on the business of wireless experts, &c. The directors are: Frank Christy, M.I.E.E., "Ramswall," Roxwell Road, Chelmsford; Leonard F. Christy, A.M.I.E.E., Crohamhurst, Roxwell Road, Chelmsford; Henry J. Aylott, A.M.I.E.E., "Greengates," Mildmay Road, Chelmsford; Chas. E. Smith, "Leighton," Rainsford Avenue, Chelmsford; Geoffrey Christy, B.Sc. (Eng.), "Patterdale," St. Fabians Drive, Chelmsford. Secretary: A. A. Gates.

Clear-Radio, Ltd.—Private company. Registered November 7th. Capital, £25,000 in 10,000 preference and 15,000 ordinary shares of £1 each. Objects: To acquire the undertaking and assets of Clear-Radio, Ltd. (incorporated in 1931), to establish, maintain and develop a service for the relaying of wireless, radio and television entertainment programmes and news to subscribers and others, &c. The directors are: E. Hall, "Merlewood," Moorgate Grove, Rotherham; S. R. Macdonald, "Elstan," Orchard Way, Esher; B. H. Lyon, 25, Chelsea Park Gardens, S.W.3. Secretary: S. R. Macdonald. Registered office: Bush House, Aldwych, W.C.2.

Four-in-One Fuse (Great Britain) Proprietary, Ltd.—Particulars filed October 24th pursuant to Section 344 of the Companies Act, 1929. Capital, £20,000 in £1 shares. The company was incorporated in Australia on September 22nd, 1932, to acquire from W. J. McCredie and F. G. Irving the right to use in the United Kingdom an invention entitled "improvements in and relating to electrical fuses of the multiple element type." Registered office: 434, Collins Street, Melbourne. British address: 113, Kingsway, W.C.2, where A. W. Fisher is authorised to accept service of process and notices on behalf of the company.

Renlin, Moreton, Ltd.—Private company. Registered November 9th. Capital, £300 in 175 6 per cent. cumulative participating preference shares of £1 each and 2,500 ordinary shares of 1s. each. Objects: To carry on the business of electrical engineers, electricians, contractors, manufacturers of and dealers in electrical and other appliances, &c. The directors are: F. M. Gillmore, 71, The Drive, N.W.11; and W. Yaldren. "Gothic House," 18, Eversleigh Road, S.W.11. Registered office: Staple House, 51-52, Chancery Lane, W.C.2.

Relay Developments, Ltd.—Public company. Registered November 6th. Capital, £25,000 in 20,000 7 per cent. cumulative preference shares of £1 each and 20,000 ordinary shares of 5s. each. Objects: To acquire and hold shares, stocks, debentures and securities issued by any company constituted or carrying on business engaged in the construction, erection and maintenance of stations for the reception and distribution of radio signals, &c. The subscribers are: E. L. Hutchings, Southdowns, Thorpewood Avenue, Sydenham; F. H. G. P. Thomson, Hillside, 37, Heathurst Road, Sanderstead, and five others. Registered office: 19a, Coleman Street, E.C.2.

Mountain Ash Relay Service, Ltd.—Private company. Registered November 7th. Capital, £5,000 in £1 shares. Objects: To acquire a concession granted by the Mountain Ash Urban District Council to William R. Thomas and Edward J. James, to operate a wireless relay service in its area. The directors are: W. R. Thomas (managing director), 13, Oxford Street, Mountain Ash, and four others. Solicitors: Gwilym Jones & Davies, Bank Chambers, Mountain Ash, Glam.

Angel Engineering Co., Ltd.—Private company. Registered November 11th. Capital, £100 in £1 shares. Objects: To acquire the business of a sign manufacturer, patentee and inventor carried on by Ernest L. Angel as "A.T.C. Signs," or "A.T.C. Engineering Co.," or "Angel Engineering Co.," at King Edward's Buildings, and Station Road, Church End, Finchley, Mdx. The directors are: E. L. Angel, "Windyhills," 1, Green Avenue, Mill Hill, N.W.7; and J. V. Angel, 687, Finchley Road, N.W.3. Registered office: Station Road, Finchley, N.3.

John Holder & Co., Ltd.—Private company. Registered November 11th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, mechanical engineers, suppliers of electricity, wireless dealers and engineers, &c. The subscribers are: L. Tobias, 22, Clarendon Road, Putney, S.W.15; and Rose Gilbert, 53, Acton Street, W.C.1. Solicitor: Lucien Fier, 72, Oxford Street, W.1.

Hydrelex, Ltd.—Private company. Registered November 10th. Capital, £100 in 1s. shares. Objects: To acquire any patents, brevets d'invention, and to carry on the business of manufacturers of and dealers in electrical apparatus and appliances, &c. The first director is C. H. F. Jefferies, 14, Manorgate Road, Kingston, Surrey. Secretary: T. E. Samuels, 23, Soho Square, W.1.

Returns of Electrical Companies

Mackett & Kelk, Ltd.—T. S. Macadam, Dome Buildings, Richmond, was appointed receiver on October 18th, 1933, under powers contained in debenture dated August 9th, 1933.

Marlborough Radio Co., Ltd.—W. Nuttall, 282/6, Bolton Street, Bury, was appointed receiver and manager on October 30th, 1933, under powers contained in debenture dated June 28th, 1933.

Herne Bay and District Electricity Supply Co., Ltd.—Capital, £120,000 in 100,000 ordinary and 20,000 deferred shares of £1. Return dated June 13th, 1933. 64,006 ordinary and 20,000 deferred shares taken up. £64,006 paid on the ordinary shares. £20,000 considered as paid on the deferred shares. Mortgages and charges, £20,000.

Taylor's Radio Service, Ltd.—Particulars filed of debentures not exceeding £500 authorised September 6th, 1933, charged on the company's undertaking and property, present and future, including unpaid capital, the amount of the present issue being £125.

Electrolumination (Abadie Proces), Ltd.—First mortgage debenture dated October 31st, 1933, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital. Holders: Westminster Bank, Ltd.

Ready Radio, Ltd.—Particulars filed of £12,000 debenture stock authorised September 22nd, 1933, and covered by trust deed dated October 16th, 1933, charged on the company's undertaking and property, including any uncalled capital, the amount of the present issue being £5,530 11s. Trustees: R. J. Boden, 13, Lovell's Court, E.C.4, and others.

St. Mary's (Scilly) Electricity Supply Co., Ltd.—Particulars filed of £2,500 debentures authorised October 12th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Tubelamps, Ltd.—The nominal capital has been increased by the addition of £5,900 in £1 ordinary shares beyond the registered capital of £100.

Chamberlain & Hookham, Ltd.—Capital, £100,000 in 9,500 preference and 10,500 ordinary shares of £5. Return dated June 13th, 1933. 8,000 preference and 10,100 ordinary shares taken up. £36,990 paid on 7,298 preference and 100 ordinary shares. £53,510 considered as paid on 702 preference and 10,000 ordinary shares. Mortgages and charges, nil.

Economic Electric Co. (Liverpool), Ltd.—Capital, £10,000 in £1 shares. Return dated August 12th, 1933. 8,300 shares taken up. £8,300 considered as paid. Mortgages and charges: £4,043 (fluctuating bank charge).

"M.K." Electric, Ltd.—Capital, £2,000 in £1 shares. Return dated August 8th, 1933. 2,000 shares taken up. £768 paid. £1,232 considered as paid. Mortgages and charges: £6,600.

Joseph Lucas, Ltd.—The nominal capital has been increased by the addition of £1,200,000 in £1 shares beyond the registered capital of £1,300,000.

Sloan Electrical Co., Ltd.—Issue on November 1st, 1933, of £1,000 debentures, part of a series already registered.

Upfields Wireless, Ltd.—Mortgage on 5, Hughenden Place, Hastings, dated October 31st, 1933, to secure £900. Holders: Hastings Permanent Building Society.

Coventry Radio Factors, Ltd.—Particulars filed on November 4th, 1933, of £1,375 debentures authorised July 24th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Elkay Electrical Manufacturing Co., Ltd.—Capital, £1,000 in £1 shares. Return dated June 30th, 1932 (filed June 30th, 1933). All shares taken up. £1,000 paid. Mortgages and charges, nil.

Shoreham and District Electric Lighting & Power Co., Ltd.—Capital, £75,000 in £1 shares. Return dated June 22nd, 1933. 46,500 shares taken up. £40,000 paid. £6,500 considered as paid. Mortgages and charges, £8,666 13s. 4d. A return of allotments made up to July 7th, 1933, shows a further 8,500 ordinary shares allotted, payable in cash and fully called up.

Exe Valley Electricity Co., Ltd.—Capital, £125,000 in £1 shares. Return dated August 10th, 1933. All shares taken up. £119,700 paid. £5,300 considered as paid. Mortgages and charges, nil.

J. W. Ray & Co. (Liverpool), Ltd.—Capital, £3,000 in £1 shares. Return dated October 3rd, 1933. 2,753 shares taken up. £2,753 paid. Mortgages and charges, nil.

Vincent Switchgear Manufacturing Co., Ltd.—Capital, £10,000 in £1 shares. Return dated September 19th, 1933. 7,948 shares taken up. £7,948 considered as paid. Mortgages and charges, £3,000.

City Notes

Drake & Gorham, Ltd.—Referring to the accounts of the company for the past year Mr. R. H. M. Drake (chairman) stated at the annual meeting last week that the results disclosed were disappointing and proved that in the case of the company the effects of the severe depression were delayed; he was glad to say, however, that the general state of affairs seemed to be improving. Drastic economies had been made wherever possible, directors' fees being lowered and a temporary reduction in salaries being voluntarily agreed to by the staff. The internal organisation of the Contracting Department had also been rearranged and simplified. The company's Manchester branch was still suffering from the adverse trading conditions but there had been a considerable increase in turnover in the Electric Sign Department and a separate company had now been formed in conjunction with Electrolumination, Ltd., to concentrate on this business and equip a small factory to deal with maintenance and repairs in the Manchester district. A new branch office had been opened in Hereford.

Turning to recent important contracts, Mr. Drake said that the temporary generating plant at the Bank of England was now complete but that further work was held up until the new buildings were more advanced. The installation for Messrs. Glyn, Mills & Co.'s head office had also been carried out, as well as those at South Africa House and the Masonic Peace Memorial. The *Daily Express* building, embodying many novel lighting features, was nearly complete, and other interesting illumination schemes included St. Peter's Church, Eaton Square, and the new Regal Cinema at Wimbledon. A contract for Messrs. Johnson Matthey & Co., Ltd., comprised the complete renewal and remodelling of the company's power and lighting installation. The neon lighting installation on the Thames crossing towers at Dagenham to safeguard aircraft had a total illumination intensity of approximately 18,500 c.p. Many orders were still being received for installing lighting in workmen's cottages in various districts of London.

The company was now able to supply large industrial switchgear equipment similar in design to that which had proved so successful for public supply systems, and a lorry demonstrating the complete range of switchgear manufactured had been touring the provinces for the past few months. Business had been seriously affected by the decision regarding the legality of totalisators on dog-racing tracks, but the turnover of the Water Treatment Department continued to increase. It was proposed that the debit balance of £14,732, together with the balance of debenture stock issue expenses, making a total of £20,947, should be dealt with by transferring £22,250 from general reserve. With £1,326 brought forward there would be a credit balance of £2,629 to be carried forward.

S. Smith & Sons (Motor Accessories), Ltd., report a profit for the period July 30th, 1932, to August 5th last of £132,755, as compared with £86,833 to July 30th, 1932, to which is added £49,476 brought in making £182,231. After providing for depreciation, &c., the preferred dividend is doubled at 14 per cent., while the deferred capital receives 25 per cent., the first payment since 1929-30, when 18¾ per cent. was paid. The amount carried forward is £65,241. The report states that the demand, both at home and abroad, has increased during the year. There have been further developments by Smiths' English Clocks, a wholly owned subsidiary which handles the domestic, or household, clock section of the business. Meeting: November 23rd.

The Tata Companies.—The accounts of the *Tata Hydro-Electric Power Co.* for the year ended June 30th last show net profits of Rs.34,02,232, which with an amount brought in makes Rs.35,65,239. After providing for loss on investments, setting aside a sum for bad and doubtful debts, &c., Rs.15,39,225 is available for distribution. A final ordinary dividend of Rs.4-8-0, tax free is paid (same) and Rs.3,77,790 is carried forward. At the annual meeting held in Bombay recently it was stated that owing to the serious condition of the Bombay textile industry, a 10 per cent. discount for prompt payment to textile mill consumers was sanctioned, which resulted in a decline in revenue.

The Tata Power Co. reports net profits for the year ended June 30th last of Rs.13,09,027, as compared with Rs.13,45,560 in the preceding year. To this is added Rs.1,61,272 brought in and Rs.1,50,000 transferred from reserve, making Rs.16,20,299. It is proposed to pay an ordinary dividend of Rs.10 per share, tax free (against nil), and to pay a bonus to the staff of Rs.15,000. A balance of Rs.75,406 is carried forward. The report states that the railway consumption was disappointing for the third consecutive year and the depression in the textile industry has also adversely affected the revenue. Efforts are being made to secure additional load, with some measure of success.

At the annual general meeting of the *Andhra Valley Power Supply Co.* the chairman pointed out that though the gross revenue for the year ended June, 1933, showed a decrease from that of the preceding year, the net profit was the highest in the history of the company. This was due in part to a reduction in working expenses, but mainly to a reduction in interest charges, which were likely to show a further reduction during the current year. The company, in view of the depressed condition of the textile industry, sanctioned a discount of ten per cent. in the bills to the textile mills. The dividend on the ordinary shares of the company has been increased year by year during the past four years and for the year under review it stands at 7½ per cent.

The West Devon Electric Supply Co., Ltd.—Lists were to be opened yesterday (Thursday) for an issue of £50,000 of 6 per cent. £1 preference shares at 26s. per share and 50,000 ordinary £1 shares at 24s. per share. This company was formed to take over the non-statutory electricity undertakings at Okehampton, Tavistock, Chagford, Yelverton, Hatherleigh, Bere Alston, and Horrabridge, and has since acquired the undertakings at Princetown and North Tawton, and the whole of the issued capital of the Bude Electric Supply Co., Ltd., and the Holsworthy Electric Supply Co., Ltd. Since assuming control the company has been engaged in reorganising and co-ordinating the whole of the system of supply, with a view to the conversion of all the undertakings to the a.c. system. The proceeds of the present issue will be utilised to defray the costs of the development of the company's undertaking and for general purposes.

The Buenos Ayres Great Southern Railway Co., Ltd.—Presiding at the annual meeting held in London on November 8th, Mr. H. C. Allen (chairman), in the course of his speech, referred to the further development of Diesel-electric traction on the company's system. They had sent out two mobile power houses, each of 1,200 h.p., and encouraged by the results obtained from these they had put three more units, each of 1,700 h.p., into service in June this year, and up to the present they had run some 45,000 miles. Each of these 1,700-h.p. power houses operated an eight-coach train, the total weight of which was 526 tons. Seating capacity was provided for 916 passengers. In addition to these units a 1,700-h.p. Diesel-electric locomotive had been sent out, and trials had proved satisfactory.

The Mersey Power Co., Ltd.—At an extraordinary meeting held in Liverpool on November 14th, a resolution was carried authorising the directors to create and issue £250,000 3½ per cent. first debenture stock. Mr. H. J. Falk (chairman), who presided, explained that the primary purpose of the issue was to repay the loan to the company of £175,000 under the Trade Facilities Act. The balance of the money was required for the general purposes of the company.

Cape Electric Tramways, Ltd., reports a profit for the year ended June 30th last of £39,937, against £36,572 for 1931-32. After deducting debenture interest, &c., there is a balance of £14,281, which with £50,764 brought in makes £65,045 available. From this is deducted a dividend of 2½ per cent. declared at the last annual meeting, leaving £52,764 to be carried forward. During the year the tramways in Capetown and Port Elizabeth carried 27,861,095 passengers, as against 28,832,989 in 1931-32. The report states that the effects of the severe and, in many respects, unfair competition with which the company has had to contend in recent years, have largely been overcome, and the revenue receipts since the close of the financial year show that the company's business is progressing satisfactorily.

Companies to be Struck off the Register.—The names of the following companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary:—Apex Radio, Ltd.; Electric Lamp Distributors, Ltd.; Fay Radio & Recorders (1933), Ltd.; Midland Metropolitan Electric Co., Ltd.; Pegwin Electric Supplies, Ltd.; Red Triangle Electric Co., Ltd.

The Metropolitan Electric Supply Co., Ltd., has decided to issue 160,000 ordinary shares at present unissued as rights to ordinary shareholders in the proportion of one new share for each fifteen ordinary shares held, at the price of 40s. per share.

Siemens Bros. & Co., Ltd., have decided not to pay an interim dividend on the ordinary shares in respect of the current year. For several years interim dividends of 2½ per cent. have been paid.

The Melbourne Electric Supply Co., Ltd., has announced a final dividend on the consolidated ordinary stock of 3½ per cent., making 6¼ per cent., tax free, for the year. This is at the same rate as in the preceding year.

The Adelaide Electric Supply Co., Ltd., has declared a final dividend of 4½ per cent., tax free, on the ordinary stock, maintaining the total distribution for the year at 8½ per cent.

Telephone Properties, Ltd., has declared an interim dividend of 2 per cent., actual, less tax, on the ordinary shares. No interim distribution was made last year, but the final dividend was 8 per cent.

R. A. Lister & Co., Ltd., report a net profit for the year ended September 30th last of £47,264, which with £104,986 brought in makes £152,250 available. It is proposed to pay a dividend of 7½ per cent. on the ordinary shares and to carry forward £105,020. Meeting: November 17th, at Dursley.

The London Power Co., Ltd., has placed privately £1,000,000 of 4 per cent. redeemable debenture stock, 1952-72. An interest payment of 30s. per cent. is due on July 1st next.

Stocks and Shares

TUESDAY EVENING.

IN the constant demand for stocks and shares by the investor who is worried by to-day's problem of obtaining a reasonable rate of interest on his money, the trend of prices is steadily and inevitably upwards. Most people are looking forward rather anxiously to the time when gilt-edged stocks shall have reached their apex, and start on a downward track. This trend, it is popular to prophesy, such stocks are certain to pursue as national trading increases, and the capital demand from industry expands. The Board of Trade figures for last month are quoted in support of the contention that home trade is in a more healthy condition than has been the case for years past. Stock Exchange and City men are aware of the present-day investor's dislike of American and foreign stocks, and of the occasional orders that come to London for the purchase of British issues on behalf of clients resident in the United States or on the Continent. It becomes increasingly evident that this country is regarded as offering a greater measure of security and of stability than any other. The plunge in the value of the dollar has made evident to the world at large the uncertainties that attach to investment in American securities. In the circumstances, it is no more than natural

to find prices of British stocks and shares holding their high levels. As a counteraction, there must be set the unquestionable fact that investment is disturbed by the slump in the dollar, the political position in Germany and various economic problems in other parts of the world.

Central Electricity 3½ per cent. stock at 93 is ½ higher. The London Passenger Transport stocks have not moved, the "C" issue remaining heavy at 81.

Electricity Supply Shares

In the market for home electricity supply shares, City of London ordinary have risen to 35s. South London ordinary, Westminsters and London Electrics have advanced to the common level of 34s. 6d. The pre-ordinary shares continue in demand. Lancashire Electric 6 per cent. preference have strengthened to 36s., and of the debenture stocks, West Gloucestershire 5½ per cent. debentures are better at 110½. The latter company's ordinary has eased off to 68½. Hendons at 55s. 6d. are a trifle below the best. North Metropolitans hold their price at 60s. 6d.

Stocks on Offer

It may be of service to mention that there is on offer £10,000 of the new North Eastern Electric Supply 3½ per cent. consolidated debenture stock at 97, free of stamp and fee. This gives a return of £3 12s. per cent. on the money, but no interest is payable until July 1st next year, when £1 3s. 4d. per cent. will become due. The interest service is well covered, as the recent prospectus showed, and the modesty of the yield is explainable by reference to the appetite for soundly secured stocks of this nature. In the foreign group, £2,500 Whitehall Electric 6 per cent. first mortgage debenture stock can be obtained at 106½, this giving £5 12s. 6d. per cent. Interest payments are due on the 1st of April and October. The amount required for the annual dividend service is £173,654, and to meet this there was, in the last published accounts, £434,000 available. The stock is redeemable by purchase or by drawings at 100, by means of a 2 per cent. cumulative sinking fund. This sinking fund is now in operation.

Preference Shares Available

Notting Hill Electric 6 per cent. preference shares of £10 each can be bought as to 100 shares at 14½, to yield practically 4½ per cent. on the money, with a dividend payment due on January 1st. A couple of thousand Scottish Power 6 per cent. preference are on offer at 30s., yielding £3 19s. 3d., with February and August dividends. The dividend service was covered, according to the last published accounts, 3½ times over. A reasonable line of British Thomson-Houston 7 per cent. cumulative preference can be bought at 29s. 3d., giving 4¾ per cent. The dividends are payable at the end of June and December. To meet the £78,750 required for the dividend service there was available in the accounts last published £292,000. Shropshire, Worcestershire & Staffordshire 6 per cent. preference are on offer as to 5,000 shares at 29s. 6d., these yielding £4 1s. 3d. per cent. The dividends are due at the end of March and September, and in the latest accounts the dividend service was protected about 2½ times. Several thousand Yorkshire West Riding Electric Tramways 6 per cent. preference have come on offer at 23s. 3d., the yield being £5 3s. 3d. per cent. The dividends, due in January and July, take £10,408 annually. The company's last accounts showed £31,000 profit available to meet this charge.

Cables and Wireless

Lack of business is assumed to be the reason for the heaviness of Cables & Wireless stocks. The preference is 2 lower at 72½ and the "A" ordinary has eased off to 25. Globe Telegraph & Trust ordinary is down 5s. to 10½ in sympathy with the dullness of Cables & Wireless. American Telephone & Telegraph stock has shed a further 4 points, the price being now down to 113½, but Internationals at 14¼ have recovered 1½, to 14¾. New York Telephone 4½ per cent. bonds are 10 lower at 100. The Anglo-American issues keep very firm, supported by investment demand: the 6 per cent. preferred is a point to the good at 115½.

Dollar stocks are weak, as might be supposed. Brazilian Tractions at 11¼ are 2 lower. The Canadian-Mexican issues show no particular changes on the week.

Manufacturing and Equipment

The news that Siemens had passed their interim dividend on their ordinary shares came as an unpleasant surprise. The price of the shares was promptly lowered ½, to 22s., because, although the interim dividend last year was no more than 2½ per cent., less tax, this year's results were expected to yield at least a similar sum. For the whole of 1932-1933, Siemens paid 6½ per cent., as against 7½ per cent. in the previous twelve months. Johnson & Phillips went back to 19s. 6d., the company again passing its interim dividend. General Electrics fell back to 44s. and Associated Electrical Industries to 18s. 9d. The latter company's preference shares have risen 9d. to 33s. 3d. The firmest spot in the equipment section is that for Telegraph Constructions, the price of which has gone up to 28s. 9d. Enfield Rolling Mills attract a fair amount of attention at 28s. 9d.

Babcock & Wilcox at 2 are slightly better. Iron and steel shares remain in favour, on account of the better trade outlook. The rubber share market is quiet, to the verge of somnolence.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, Nov. 14.	Rise or Fall.	Yield. p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	78/9	—	3 16 0
Brompton Ordinary	1	8½	7	34/-	—	4 2 4
Charing Cross Ordinary	1	8½	7	34/6	—	4 1 2
Chelsea	1	9½	7	33/6	—	4 3 7
City of London	1	10	10	35/-	+⅛	4 0 0
Clyde Valley	1	7	7	40/-	—	3 10 0
County of London	1	10½	10½	56/3	—	3 14 8
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 15 9
Elec. Supply Corporation	1	11	11	80/-	—	2 15 0
Kensington Ordinary	1	8	7	34/-	—	4 2 4
Lancs Light and Power	1	7	7	36/3	—	3 17 2
London Electric	1	9	7	34/6	+6d.	4 1 2
Metropolitan	1	10	10	52/6	—	3 16 0
Midland Counties	1	7	7	37/-	—	3 15 8
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	34/-	—	3 10 8
Do. 7% Pref.	1	7	7	34/6	—	4 1 2
Northampton	1	10	10	55/-	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13¾	—	4 8 11
North Met. Elec. 6% Pref.	1	6	6	30/-	—	4 0 0
St. James' and Pall Mall	1	8	7	34/-	—	4 2 4
Scottish Power	1	8	8	38/9	—	4 2 6
South London	1	8½	7	34/6	+6d.	4 1 2
Westminster Ordinary	1	8½	7	34/6	+6d.	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/0	—9d.	7 10 0
Yorkshire Elec.	1	8	8	46/3	—	3 9 3
Public Boards.						
Central Electricity, 1950-70	Stock	5	5	114	—	4 7 6
Do. 1951-73	„	4½	4½	109½	—	4 2 2
Do. 1963-93	„	—	3½	93	+½	3 15 3
London & Home Counties 1955-75	„	4½	4½	110	—	4 1 10
London Passenger Transport, A	„	—	4½	117	—	3 17 0
Do. do. B	„	—	5	121	—	4 2 8
Do. do. C	„	—	—	81	—	—
Telegraph and Telephones.						
American Tel. & Tel.	$100	9	9	113½	—4	7 18 7
Anglo-Am. Tel. Pref.	Stock	6	6	115½	+1	5 4 0
Do. Def.	„	1½	1½	29½	—	5 1 8
Cables & Wireless 5½% Pref.	„	2¾	2¾	72½	—2	3 15 11
Do. A 7½% Ord.	„	Nil	Nil	25	—½	—
Do. B Ord.	„	Nil	Nil	11	—	—
Globe Tel. and T. Ord.	10	Nil	2½	10½	—½	2 8 9
Do. do. Pref.	10	6	6	12½	—	4 16 0
Great Northern Tel.	10	20	20	32½	—	6 3 0
Marconi-Marine	1	10	7½	28/9	—	5 9 1
Oriental Telephone Ord.	1	12	12	2⅛	—	*4 1 6
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	3/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	490	—	—
Do. do. Pref. Ord.	„	8	8	144½	—	5 10 9
Brazil Traction	100	—	—	11½	—2	—
Brit. Columbia Elec. Rly. Pfce.	Stock	5	5	103	—	4 17 0
Mexico Trams, 5% Bonds	—	5	5	31½	—	15 16 4
Mexican Light Common	100	Nil	Nil	7½	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds	—	5	5	45	—	11 2 8
Victoria Falls Ord.	1	15	20	5½	—⅛	3 18 0
Yorkshire (West Riding)	1	Nil	Nil	15/-	—	—
Manufacturing Companies.						
Assoc. Elec. Ord.	1	4	4	18/9	—⅛	4 5 4
Do. Pref.	1	8	8	33/3	+9d.	4 16 6
Babcock & Wilcox	1	14	9	2	+6d.	—
British Aluminium Ord.	1	5	5	30/-	—6d.	3 6 8
British Insulated Ord.	1	15	15	73/9	—	3 19 2
Brush Ord.	Stock	Nil	Nil	40	—	—
Callender's	1	15	15	68/3	—	4 8 0
Do. 6½% Pref.	1	6½	6½	31/3	—	4 8 2
Crompton Parkinson Ord.	5/-	22½	—	18/3	—	6 5 7
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	95/-	—	5 5 5
English Electric	1	Nil	Nil	8/9	—	—
Do. do. Pref.	1	Nil	Nil	12/6	—⅛	—
Ever Ready	5/-	35	35	30/-	+3d.	5 16 8
Ferranti Pref.	1	7	7	27/6	+6d.	5 1 10
G.E.C. Pref.	1	6½	6½	32/-	—	4 1 2
Do. Ord.	1	8	8	44/-	—⅛	3 12 8
Henley's	1	30	30	6½	—	4 12 4
Do. 4½% Pref.	1	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/3	—	—
Johnson & Phillips	1	5	5	19/6	—6d.	5 2 7
Siemens Ord.	1	7½	6½	22/-	—½	—
Telegraph Construction	£1	Nil	Nil	28/9	+⅛	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1932

5165. "Static electric transformers and the application of such transformers to cooking stoves, cooking utensils, and the like." N. W. Gilbert. February 22nd, 1932. (Cognate application 7747/32.) (400233.)

7975. "Insulated electrical cables." Johnson & Phillips, Ltd., A. P. Pyne, and T. B. Parker. March 17th, 1932. (Cognate application 17426/32.) (400235.)

8008. "Frequency selection means for use in high-frequency electrical circuits." Marconi's Wireless Telegraph Co., Ltd., and A. T. Witts. March 17th, 1932. (400215.)

8152. "Electric transformers." International General Electric Co., Inc. March 18th, 1931. (400236.)

8532. "Electric conductor wires, particularly for use as wireless aerials." L. S. Hargreaves. March 22nd, 1932. (400241.)

10371. "Electrical heating devices for baking or other ovens." G. R. Baker and Baker Perkins, Ltd. April 11th, 1932. (400219.)

10598. "Electrolytic meters or recording devices." E. Kramer. April 22nd, 1931. (400221.)

10613. "Electric regulating systems." British Thomson-Houston Co., Ltd. April 17th, 1931. (400202.)

10622. "Dynamo-electric units for remote signalling, indicating or control systems." Bendix Aviation Corporation. April 14th, 1931. (400203.)

10939. "Electrical indicating apparatus." British Power Railway Signal Co., Ltd., and R. Mordin. April 16th, 1932. (400205.)

10953. "Electric regulators." British Thomson-Houston Co., Ltd. April 17th, 1931. (400206.)

11083. "Control of the flow of current in electric circuits." T. F. E. Watson and Westinghouse Brake & Saxby Signal Co., Ltd. April 18th, 1932. (400246.)

11329. "Electrolytic cells." D. J. Evans. April 20th, 1932. (400247.)

11503. "Electrolytic manufacture of iron and its alloys." E. Kelsen and E. Ausnit. April 22nd, 1931. (400254.)

11574. "Apparatus adapted to produce electric fields of high frequency having multiple wavelengths." G. Lakhovsky. May 2nd, 1931. (400257.)

11619. "Cut-outs for series-connected electric lamps or the like." British Thomson-Houston Co., Ltd. April 23rd, 1931. (400263.)

11674. "Radio and other high-frequency receivers." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust, and R. F. O'Neill. April 22nd, 1932. (400268.)

11705. "Methods of manufacturing loaded electrical conductors." Electrical Research Products, Inc. May 20th, 1931. (400271.)

11724. "Wireless transmission systems." G. W. Walton. April 23rd, 1932. (400273.)

11733. "Photophones." Marconi's Wireless Telegraph Co., Ltd., G. M. Wright, and G. F. Brett. April 23rd, 1932. (400275.)

11734. "Direction-finding systems for use in connection with aircraft." Marconi's Wireless Telegraph Co., Ltd., and A. A. Linsell. April 23rd, 1932. (400276.)

11735. "Inductance coils and methods of manufacture thereof." Marconi's Wireless Telegraph Co., Ltd., and F. E. Robinson. April 23rd, 1932. (400277.)

11740. "Directional wireless signalling." J. P. Bowen and Marconi's Wireless Telegraph Co., Ltd. April 23rd, 1932. (400279.)

11976. "Method of and means for transmitting signals electrically to a distance." C. Midworth. April 26th, 1932. (400289.)

11985. "Electric regulating apparatus." British Thomson-Houston Co., Ltd. April 27th, 1931. (400290.)

12090. "Electric switches with quick make-and-break action." A. B. Mudie. April 27th, 1932. (400293.)

12116. "Electric regulating systems." British Thomson-Houston Co., Ltd. April 27th, 1931. (400294.)

12814. "Electrically heated overlays, mattresses, pads, blankets, and the like." A. Sykes. May 4th, 1932. (400301.)

13218. "Switch apparatus for the control of electric circuits." A. G. Kershaw and Westinghouse Brake & Saxby Signal Co,. Ltd. May 7th, 1932. (400307.)

14595. "Short-wave oscillators and apparatus for use in association therewith." Marconi's Wireless Telegraph Co., Ltd. June 24th, 1931. (400319.)

14600. "Electrode for the neon type of luminous electric discharge tube." F. B. Dehn (Neon Electrical Products Corporation). May 23rd, 1932. (400320.)

14605. "Radio receiving apparatus." E. K. Cole, Ltd., A. W. Martin, H. Hunt, and E. J. Wyborn. May 23rd, 1932. (400321.)

15778. "Electromagnetic selectors as used in automatic or semi-automatic telephone systems." General Electric Co., Ltd., and R. M. Hamilton. June 4th, 1932. (400328.)

16198. "Ignition systems of internal combustion engines." Fairey Aviation Co., Ltd., and A. G. Forsyth. June 8th, 1932. (400329.)

16818. "Process for sealing wires into vitreous envelopes." General Electric Co., Ltd., R. L. Breadner, and C. G. Eden. June 14th, 1932. (400334.)

17399. "Electric regulating resistances." H. G. C. Fairweather (Eclairage des Vehicules sur Rail). June 20th, 1932. (400339.)

17434. "Signalling or indicating apparatus actuated by the passage of a vehicle." Siemens & General Electric Railway Signal Co., Ltd., and F. L. Castle. June 20th, 1932. (400340.)

17633. "Sound-reproducing instruments." L. Young and A. Young (trading as Vitavox Acoustics). June 22nd, 1932. (400343.)

18317. "Highly emissive cathode for cathode-ray tubes." Radioakt.-Ges., D. S. Loewe, and B. Wienecke. June 30th, 1931. (400351.)

20271. "Variable condensers for use in wireless receiving apparatus." A. W. MacNamara. July 18th. 1932. (400366.)

20515. "Devices comprising a gas-filled electric discharge tube having one or more incandescent electrodes." Naamlooze Vennootschap Philips Gloeilampenfabrieken. July 25th, 1931. (400368.)

21043. "Coin-freed electricity meters." Chamberlain and Hookham, Ltd., and S. James. July 26th, 1932. (Addition to 346538.) (400376.)

23327. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 24th, 1931. (400388.)

23350. "Arc-preventing devices for multi-phase lever switches." W. W. Triggs (Felten and Guilleaume Carlswerk Akt.-Ges.). August 19th, 1932. (400389.)

26686. "Electrical filters." Marconi's Wireless Telegraph Co., Ltd. September 24th, 1931. (400404.)

27217. "Electric valve circuits." British Thomson-Houston Co., Ltd. October 1st, 1931. (400406.)

28710. "Electric discharge tubes." C. Lindstrom Akt.-Ges. October 20th, 1931. (400410.)

30179. "Control of direct-current electric motors." G. M. Pestarini. November 16th, 1931. (400416.)

30603. "Accumulator with soluble cathode." K. Griebel. October 31st, 1932. (400424.)

32868. "Fixation of nitrogen by means of an electric arc." E. Briner and C. H. Wakker. November 21st, 1931. (400431.)

33557. "Synchronous alternating-current motors, particularly for talking-machine driving." Siemens-Schuckertwerke Akt.-Ges. September 29th, 1932. (400435.)

34443. "Microphones." Marconi's Wireless Telegraph Co., Ltd. December 5th, 1931. (400440.)

36617. "Braun tubes or cathode-ray tubes suitable for use for television, picture telegraphy, and other purposes." Telefunken Ges. für Drahtlose Telegraphie. December 24th, 1931. (400453.)

1933

952. "Luminous electric discharge tubes." General Electric Co. Ltd. January 11th, 1932. (400458.)

2499. "Electric igniter, adapted also for use for pyro-engraving, thermocauterising, and similar purposes." E. Mouling. January 26th, 1933. (Addition to 362599.) (400469.)

3227. "Railway signalling systems." General Railway Signal Co. "February 4th, 1932. (400471.)

4144. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd. February 10th, 1932. (400473.)

4401. "Flashlight lamp." M. Igari. February 12th, 1932. (400476.)

6665. "Electrolytic cells, particularly condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 5th, 1932. (400490.)

7767. "Dielectric of condensers." W. W. Triggs (Meirowsky and Co. Akt.-Ges.). March 14th, 1933. (400499.)

8603. "Cut-out switch for exposed electric conductors." G. Kunz. March 23rd, 1932. (400505.)

8831. "Sheet-metal casing for electric motors." Skoda Works, Pizen. March 25th, 1932. (400507.)

8861. "Sockets for plug-and-socket contacts." Stocko Metallwarenfabriken. Ges. August 22nd, 1932. (400509.)

9079. "Means for electro-plating." A. E. Newey. March 25th, 1933. (400510.)

11035. "Loud-speaker change-over switch, especially for radio distributing apparatus." Naamlooze Vennootschap Heybroek's Groothandel. July 28th, 1932. (400526.)

12033. "Variable condensers." W. Rogers and Wingrove & Rogers, Ltd. April 25th, 1933. (400531.)

16533. "Knee-control mechanisms for electric sewing-machines." Singer Manufacturing Co. June 25th, 1932. (400554.)

16754. "Track circuit signalling systems." British Power Railway Signal Co., Ltd., S. L. Glenn, H. Tinsley, and D. C. Gall (trading as Tinsley and Co.). December 8th, 1932. (Divided application on 34146/31). (400556.)

17946. "Cover for accumulator containers." Britannia Batteries, Ltd. July 15th, 1932. (400561.)

18413. "Blades for electric fans." British Thomson-Houston Co., Ltd. (General Electric Co.). June 28th, 1933. (400564.)

20243. "Electrical apparatus for the detection of measurement of phase differences or for both purposes." M. K. Taylor and Ferranti, Ltd. January 13th, 1932. (Divided application on 1068/32.) (400191.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 8th :—

Regina (lettering and design). No. 542848. Class 4. Electric and galvanic carbons.—C. Conradty Gesellschaft, Nuremburg, Germany. (British representative: S. Sokal, 1, Great James Street, Bedford Row, W.C.1.)

New Radios for Old; New Sets for Old (lettering and design). No. 542711. Class 8. Radio-telephonic receiving and transmitting apparatus and parts thereof.—Radialaddin, Ltd., 46, Brewer Street, W.1.

Winner. No. 545013. Class 8. Electric dry batteries, cells, and accumulators (not for medical purposes).—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.

Rylophone. No. 545235. Class 8. Radio-telephonic receiving and transmitting sets.—Rylands & Sons, Ltd., 6, High Street, Manchester.

Ebcon. No. 545172. Class 40. Goods made of ebonite.—Ebonite Containers, Ltd., Belle Isle, York Road, King's Cross, N.7.

Westmorland Supply Extensions

Messrs. Johnson & Phillips, Ltd., inform us that a further area of the scheme of the Westmorland & District Electricity Supply Co., Ltd., was made "alive" on November 8th. The current was switched on in the southern area, and a supply given to Arnside and Carnforth. In the northern area, the supply was extended to Appleby. At the present rate of progress a supply will be available to Milnthorpe in a week or two, and to Kirkby Lonsdale shortly afterwards. Negotiations with land owners for wayleaves, the construction of overhead lines, laying of cables, &c., were carried out in a very short time.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberlour.—Improvements to church (£2,500); Rev. Donald S. Mackenzie.

Banstead (SURREY).—Houses (196), Chipstead Way, Woodmansterne, for F. H. Ayling, Ltd., builders, Sydenham Road North, Croydon.

Barnstaple.—Ice-cream factory, Lion Mills, Bradiford, for A. J. Dennis. Extensions, Newport Glove Works, for Dent, Allcroft & Co., Ltd.

Birkenhead.—Flats (£38,067); G. P. Snape & Sons, builders.

Birmingham.—Community centre, Creswell Road, Bushmore Farm Estate, for Cadbury's of Bournville (£5,000), with electrical work; Wm. Bishop, builders, King's Heath.

Bournemouth.—Houses (20), Claremont Avenue; A. E. Adams. Medical and other baths, Pier Approach (£75,000); K. M. B. Cross, architect. Isolation hospital; borough engineer.

Buckhaven.—Houses (350); T. L. Brown, burgh surveyor, Municipal Buildings.

Cardiganshire.—Extensions, Cardigan schools; Rhys Jones, county architect, Llandyssul.

Caterham.—Church, Godstone Road, for Whyteleafe United Free Church; E. Marwood.

Cheshire.—Schools, Altrincham, Cheadle, and Sale (£6,725); county architect.

Clacton-on-Sea.—Reconstruction of the Blue Lagoon, the Pier (electrical work), for E. Kingsman.

Coalville.—Municipal offices (£10,829); Walter Moss & Son.

Coventry.—Senior school, Hen Lane, for City E.C.; director of education.

Croydon.—Houses (40), Cherry Hill Gardens; W. Robinson. Houses (38), Oak Avenue; Chart, Son & Reading.

Devizes.—Houses (38); T. V. Trumper, architect.

Dover.—Houses (46), Main Road, Whitfield, for E. Greenhalgh.

Droitwich.—Cinema for Cinematograph Services, Ltd., 63, Temple Row, Birmingham; E. S. Roberts, architect, New Street, Birmingham.

Dudley.—Offices, Scrim Manufacturing Co., Ltd., London Fields, with electrical work; W. Lindley, builders, Flood Street.

Dunoon.—Houses (18), for Stirling & Brown, Broomfield Avenue, Kilbride (£3,480).

Durham.—Mental institution, School Ayecliffe (£38,400), and elementary school, Hurworth; county architect.

Edinburgh.—Houses (14), Belford Gardens, &c.; C. E. Tweedie & Sons, architects, 54, Frederick Street. Houses (76), Riversdale Crescent; J. Miller, builder, 88, Hanover Street.

Essex.—Senior school, Petits Lane, Romford (£41,560), for County E.C.

Falkirk.—Welfare centre and clinic (£4,000); Wm. Gibson, burgh surveyor, Arnotdale.

Farnworth.—Houses (18), Trafford Park; F. Ashton, surveyor, Town Hall.

Fleetwood (LANCASHIRE).—Hotels and boarding houses, Promenade (£9,000), with electrical work; J. Cryer & Sons, builders, Poulton Road.

Gosforth (NORTHUMBERLAND).—Cinema; Marshall & Tweedy, architects, 129, Pilgrim Street, Newcastle-on-Tyne.

Halifax.—Houses (100), Gibraltar Road, for Lewis J. Akroyd, Ltd., Hanson Lane.

Henley-on-Thames.—Cinema, for Regal (Henley), Ltd.

Henstead.—Houses (40); W. Evans & Son, builders, Norwich.

Horley (SURREY).—Houses, Castle Field Estate, for A. E. Guest & Co., King's Road, London, N.W. Cinema, Victoria Road, for Shipman & King, proprietors of the New Pavilion.

Hull.—Aerodrome buildings; city engineer.

Huyton-with-Roby (LANCASHIRE).—Houses (36). Huyton Quarry; A. W. Thomas, surveyor, Public Offices.

Ilford.—Houses (64), Denham Drive; J. Aldridge. Houses (204) and shops, Walden Way Estate; G. F. Seigerts. Library, Barkingside (£17,000); borough engineer. Extensions, Metropolitan Cable Works, Grove Road; F. Smith.

Ilkeston.—Houses (47), Kingston Avenue; D. E. Clegg & Sons. Houses (26), Queen's Avenue; H. Middleton.

Ipswich.—Houses (1,739), five-year scheme; borough engineer.

Irish Free State.—(BUNCRANA, Co. DONEGAL).—Houses (64); J. P. McGrath, architect, 1, Newmarket Street, Londonderry, Northern Ireland. (CORK).—Houses (86), Greenmount; Dominie M. O'Connor, architect, 29, South Mall.

Keith.—Houses (14); G. S. Stewart, burgh surveyor, Balloch Road.

Kendal.—Stores for Marks and Spencer, Ltd..; Jones & Rigby, architects, 271, Lord Street, Southport. Stores for Montagu Burton, Ltd.: Hudson Road Mills, Leeds.

Kilmarnock.—Reconstruction of the King's Cinema for Associated British Cinemas; Scottish Construction Co., 154, West Regent Street, Glasgow.

Lancashire.—School (£20,300), Huyton, for County E.C.; director of education, Preston.

Ledbury.—Houses (30); R.D.C. surveyor.

Leeds.—Houses (41), York Road Estate (£11,000); W. B. Cooper & Sons. Cinema, Chapel Street, Halton: H. T. Jones.

London.—(CITY OF LONDON).—Extensions to City of London College, White Street (£3,450); governors. (HAMMERSMITH).—Block of flats; Gordon Jeeves, architect, 53, Melbury Court, W.8. (HAMPSTEAD).—Block of flats, &c., Maresfield Gardens; Bell Property Trust, Ltd. (LEWISHAM).—Baths and library, Durham Hill; borough engineer.

Macclesfield.—Houses (100), Westbrook Estate, for E. Sargent, 51, Princess Street, Manchester; F. Annable & Son, builders, 73, Hyde Road, West Gorton, Manchester.

Maidstone (KENT).—Education offices, Springfield (£9,000); county architect.

Manchester.—Municipal school, Crowcroft Park, Longsight; surveyor's department, Education Offices, Deansgate.

Margate.—Houses (38); borough surveyor.

Melbourn (HERTS).—Houses (103); R.D.C. surveyor.

Midhurst (SUSSEX).—Houses (36); R.D.C. surveyor.

Nantwich.—Houses (314), Parkfield Estate, Wistaston, for Fletcher & Sons, Crewe.

Newburn-on-Tyne.—Houses (200), Throckley; R. Carse and Sons, builders, Morpeth.

Newcastle-on-Tyne.—Houses, Armstrong Road; T. K. White, architect, Groot Market. Cinema for the Blacks (Byker), Theatres, Ltd.; H. Waller, builder, Back Waller Street.

Northampton.—Houses (22), Broadmead Ave.; S. G. Sale & Co. Shopping centre, Broadmead Ave.; H. Martin, Ltd.

Northumberland.—Cinema, Monkseaton, for T. Fyall, Grand Theatre, Frodsham, Cheshire.

Nottinghamshire.—Central hall, Netherfield Lane School, Warsop (£3,000), and extensions, Oxclose Lane School, Mansfield Woodhouse (£3,550), for County E.C.

Nuneaton.—Canning factory, with electrical work; H. Preston, secretary, Hollow Farm, Watling Street.

Oldham.—Handicraft department, Rochdale Road Institution; C. T. Taylor, Roberts & Bowman, architects, 10, Clegg Street.

Oundle.—Houses (24); U.D.C. surveyor.

Oxford.—Houses (32), Cranmer Road; Isis Properties, Ltd. Houses (154), Rose Hill Estate; city engineer. Shops and flats, St. Clement's Street; Major C. Dore. Secondary school, Southfield (£30,367); W. J. B. Halls, Ltd., Gloucester.

Paisley.—Cinema for the Associated British Cinemas, High Street; Scottish Constructional Co., 154, West Regent Street, Glasgow.

Plymouth.—Baths, café, &c., Lumps Fort (£200,000); city engineer. Secondary school, Montpelier, for E.C.

Purfleet.—Houses and bungalows, Aveley Recreation Ground; J. L. Davies, engineer and surveyor.

Reigate.—Houses (168), Salfords, for D. A. Davey & Co., Coulsdon.

Rochester.—Factory, Gashouse Point, for the Gypsum Lime and Alabastine Co., Ltd.

Rotherham.—Houses (234); R.D.C. surveyor.

Shirley (NEAR BIRMINGHAM).—Cinema, Solihull Road and Stratford Road (£25,000) with electrical work; Satchwell and Roberts, architects, 6, New Street, Birmingham.

Shrewsbury.—Houses (24), Hafren Road and the Mount; A. W. Ward, borough surveyor, The Guildhall.

Somerset.—Senior school, Keynsham, for County E.C.; A. J. Toomer, county architect, Park Street, Taunton.

Southall.—Houses (44), St. Josephs Estate; Sharon Development Co., Ltd. aFctory extension, Scott's Road; Crown Cork Co., Ltd.

Southampton.—University college library; Gutteridge & Gutteridge, architects, 9, Portland Street.

South Shields.—Houses, Mowbray Road; J. Reid, borough engineer.

Staffordshire.—Extensions, Cannock Mining College (£10,000), and sports pavilion with shower bath, lavatories, &c. (electrical and heating work), £3,200, for County E.C.; education architect, Stafford. School, Stone (£7,575); J. & F. Wootton, Ltd., builders, Pinfold, Bloxwich.

Stirling.—Houses (350); D. W. Glass, county architect, County Buildings.

Sunderland.—Houses near Mere Knalls Cemetery; Bell Bros., builders, Cleveland Road. Swimming baths, Newcastle Road, Monkwearmouth (£30,000); borough surveyor, Town Hall.

Sutton & Cheam.—Houses (68); U.D.C. surveyor.

Sutton Coldfield.—Houses (168), Holland House Estate; borough engineer.

Sutton-in-Ashfield.—School, Alfreton Road (£5,675); H. R. Hofton & Sons, Beeston.

Tarporley (CHESHIRE).—Shops, offices and houses; Wright Bros., builders, Huxley.

Tenterden.—Houses (16), Dawbourne Wood, St. Michael's (£5,400); H. J. Hubble, contractor, East Street, Tonbridge.

Tynemouth.—Houses (1,200), in five years; borough engineer. Reconstruction of Cinema Royal, Prudhoe Street, for Atkinson and Browell; Mr. Stockdale, architect.

Upminster.—Station, for the London, Midland & Scottish Railway Co., Ltd.

Wallsend.—Houses on the west side of King's Road; W. C. Leech, builder, Coutts Road, Newcastle-on-Tyne. Houses, Stewart Street, for Richardson Bros., builders, Walkerville.

Welling (KENT).—Cinema, Upper Wickham Lane (electrical work), for Cinema Services, Ltd., Birmingham.

Welwyn (HERTS).—Houses (60); C. B. Borthwick, R.D.C. surveyor.

West Wickham (KENT).—Block of shops, Red Lodge Road, for G. E. Spencer.

Wigtownshire.—School, Stranraer, for County E.C. (£16,500); R. G. Logan, county architect, Stranraer.

Winchcombe.—Cinema and dance hall (electrical work); H. J. Trigg, builder, Hatherley.

Winchester.—Bus station, with waiting rooms, offices, &c. (£4,200); city surveyor.

Wolverhampton.—Extensions, Villiers Engineering Co., Ltd., Marston Street (£10,000), with electrical work; Wilson, Lovatt and Son, builders, Clarence Street.

Worcestershire.—School, Manor Lane, Cakemore, and extensions, Hill Top School, and school, Stourport; county architect. School, Lapal, Halesowen, for County E.C.; director of education, Worcester.

Yeovil.—St. Andrew's Church; Petter & Warren, architects, Old Sarum.

York.—Houses (36), Kilburn Park Estate; J. Foster., Flats (44); city architect.